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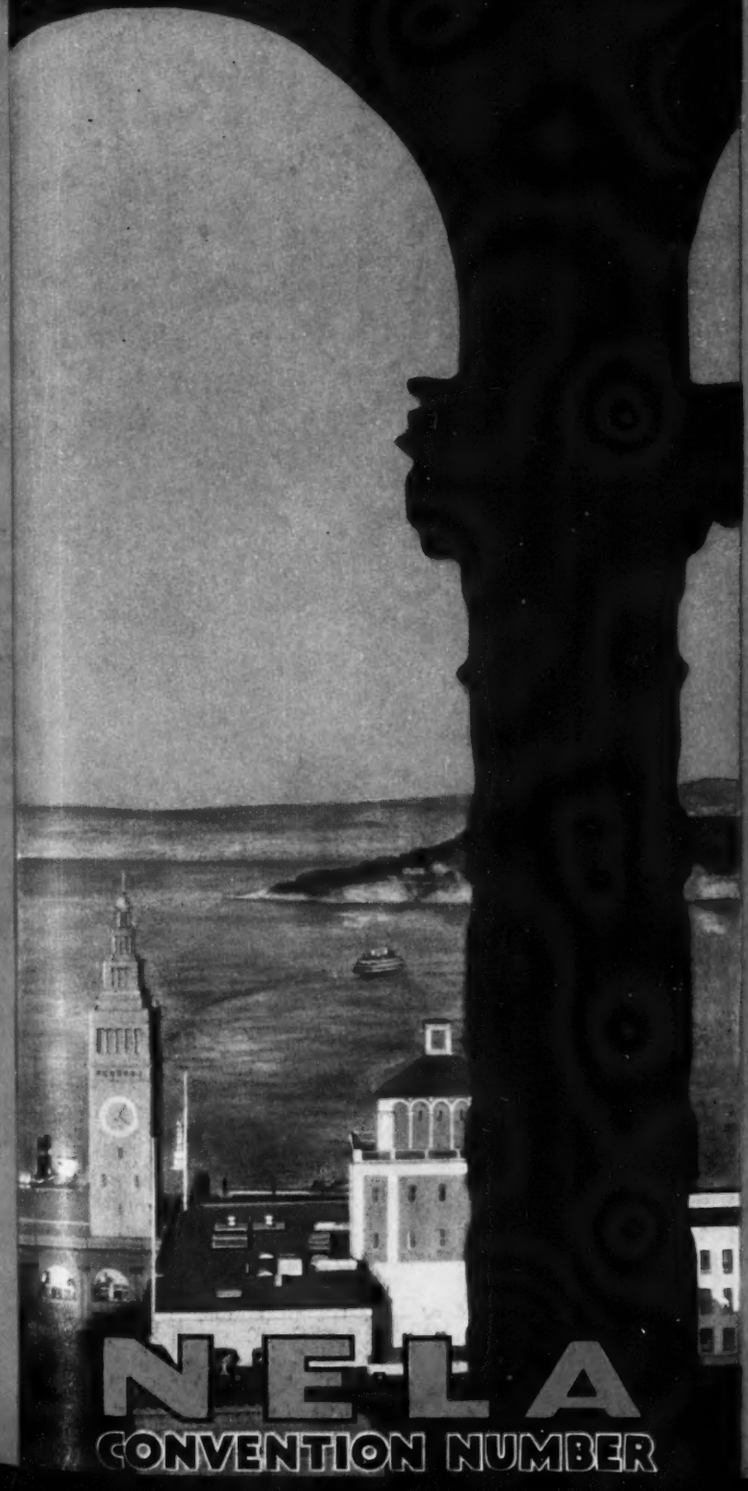

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A consolidation of Electrical World, Electrical Engineer and American Electrician

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JUNE 7, 1930

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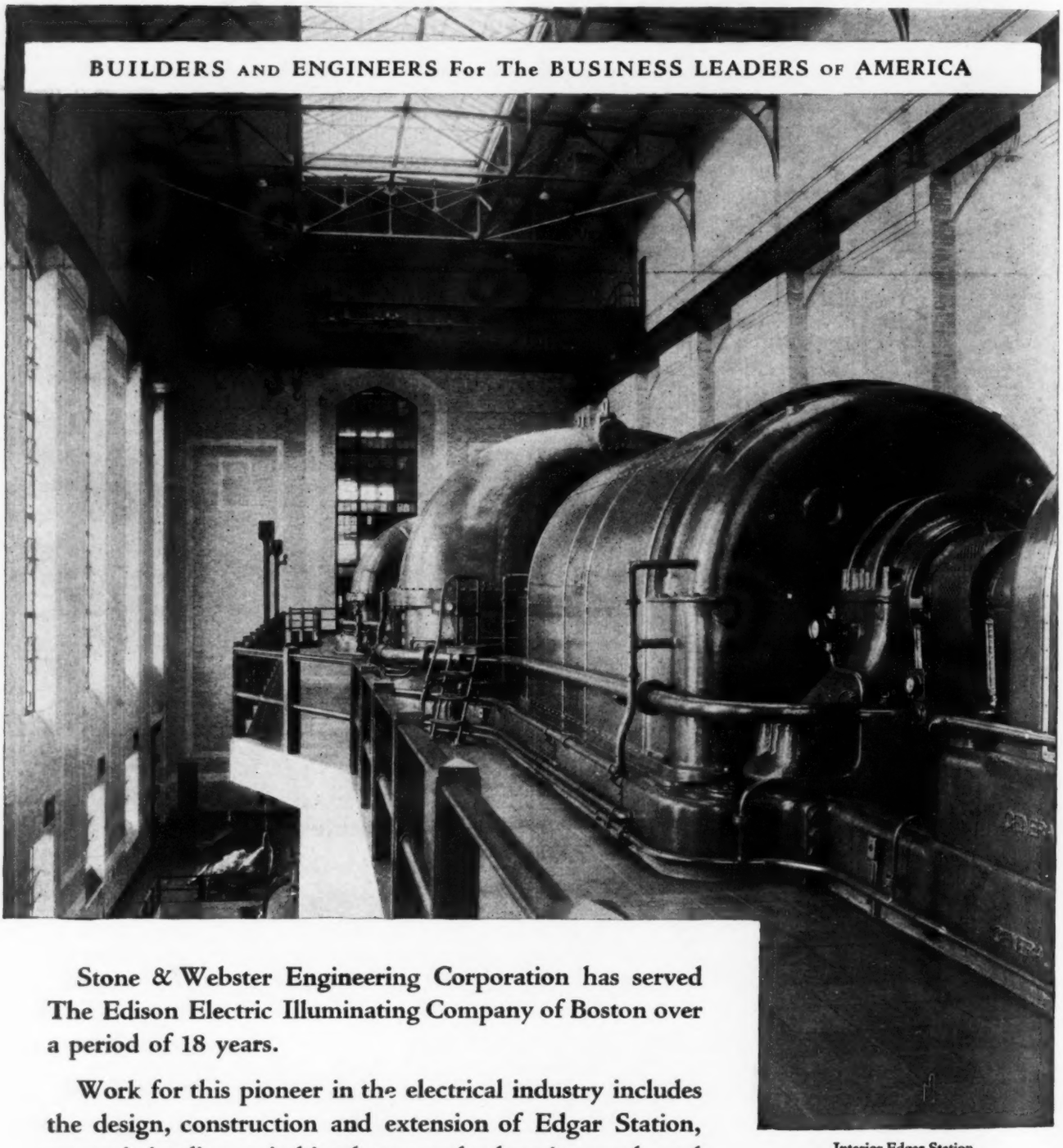

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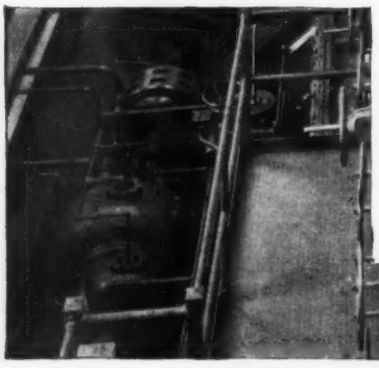

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A SUBSIDIARY OF STONE & WEBSTER, INCORPORATED

ELECTRICAL WORLD

for the Week Ending

June 7, 1930

Couzens bill meets new opposition

San Francisco awaits N.E.L.A.

Boulder Dam contracts amended

Farms served up 21.5 per cent

—WORLD POWER delegates to the number of 43 set sail for Berlin. International conference expected to draw 3,000 engineers and executives.

—DESPITE market inactivity in many directions, despite predictions of a sharp decline in financing operations, power and light issues for five months exceed those of same period last year by 7.8 per cent.

—RATES are set by customers, says Martin Insull, who sees use of service and not regulation as the basis of costs. Commercial viewpoint will, he thinks, eventually overcome "standstill institutionalism."

—FARMS served electrically increase 21.5 per cent in year, according to N. E. L. A. estimates. California still leads in number connected to lines, but Montana shows greatest increase for period.

—DOMESTIC BUSINESS—the goal is an appliance business and an energy use in homes ten to forty times that now available. Co-ordinated promotion needed. One-sale complete-service plan an attractive possibility.

—MARKET for power must be proved, according to Power Commission order. Priest Rapids, Washington, licensees will lose privilege unless they can demonstrate profitable use.

—BOULDER DAM agreements supplemented by all-party amendments designed to appease Arizonian opposition. Perhaps every one will be satisfied eventually if delays continue.

—TOMORROW'S ENGINEERING! What will it be? Sixteen leaders in their respective fields take a look ahead and find continued progress along present lines more probable than radical shifts.

NEWS OF THE WEEK

Couzens Bill Encounters Opposition, Halting House Approval

WHILE the Couzens bill providing for an independent commission of three members to administer the federal water power act will be formally reported to the House within a few days, there is grave doubt as to the ability of committee members supporting it to obtain its passage. This measure (ELECTRICAL WORLD, page 965, May 17, 1930) already has passed the Senate. It should be distinguished from the long Couzens bill that would impose, complete federal regulation on the power industry.

Representative Dempsey of New York, chairman of the rivers and harbors committee, has requested the army engineers to make a report to him outlining their objections to the bill. The War Department has formally objected to the bill on the grounds that it sets up an independent power commission that might interfere with the jurisdiction of the corps of engineers over navigable streams. Further opposition will come from Representative Wood of Indiana, who is chairman of the House appropriations committee. While he has issued no direct statement regarding the power bill, Mr. Wood upon several occasions has requested committee chairmen to refrain from reporting out any more bills that will make necessary increased appropriations. He also stated that a bill expanding a department of the government is the most objectionable kind of legislation at this time because it entails continuous extra appropriations.

Amendments will change bill considerably

A subcommittee of the interstate commerce committee has been instructed to make a redraft of the power bill for the purpose of putting in parliamentary language the amendments that were approved. The bill will then be reported out. In general, it is not believed that the amendments agreed to will materially change the status of the bill. What is regarded as the most important change is the addition of the section requiring the new commission to make regular reports to Congress similar to those tendered by the Interstate Commerce Commission. The exact language of this section has not yet been drafted, but it is believed that detailed reports will be required which will impose a great deal of extra work on the power companies concerned.

The committee also agreed to change the number of commissioners from three to five. The section approved by the Senate giving the President express authority to remove the commissioners for prescribed causes was stricken out. The provision of the Senate bill restricting the commissioners from engaging in other business also was stricken from the measure.

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International Group Enters Utility Field

BRITISH and International Utilities, Ltd., organized as a public utility investment and holding company, was formed by an American and European banking group this week, according to reports from London.

The primary object of the new company will be to invest in the leading electrical and public utility companies in the United Kingdom and British Empire. Count Volpi, former Italian Finance Minister and negotiator of the Italo-American war debt settlement, will be chairman. The initial capital will be $1,250,000.

Field, Glore & Company, Bonbright & Company and the Electric Bond & Share Company comprise the American group

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TIME OF DAY NO BAR TO SUPER-TRAVEL

Floodlighted brilliantly, at the Lakehurst station, the Graf Zeppelin took aboard her passengers in the late evening on Monday, bid New York farewell and slipped off toward Spain after a historic South American trip. International air travel is becoming a commonplace and here again does lighting do its enabling work

72,000-HP. LOWER TALLASSEE PLANT NEARS COMPLETION

Scheduled for service this year, the third plant to be built on the Tallapoosa River by the Alabama Power Company approaches completion. Preceded by Martin Dam, 135,000 hp., and Upper Tallassee, 50,000 hp., the two turbines of this project add a total of 72,000 hp. to the power derived from this stream's flow. The dam is 1,846 ft. long and operation is under a normal head of 91 ft.

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which is participating in the Volpi group of utility companies in Europe. The European Electric Corporation, recently organized in Canada by the American and European group, will be affiliated with the new holding company.

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Boulder Dam Supplement Allocates Unused Quotas

A SUPPLEMENTAL agreement to the contract between the federal government, the city of Los Angeles, the Los Angeles Department of Water and Power and the Southern California Edison Company, for control and distribution of power from Boulder Dam, has been approved by all interested parties in Southern California and sent to Washington.

The supplemental contract provides that in the event that the Metropolitan Water District of Southern California does not use all its quota of power to pump water into the proposed Colorado River aqueduct, the city and the Southern California Edison Company and associates share equally the surplus, depending upon which can put it into use, with the additional provision that the district can reobtain the power when the need for it arises. The Department of Water and Power of the City of Los Angeles is specifically stated to be a party with the city and pledges its revenues to the carrying out of the contract.

The additional agreement was requested by the appropriations committee of the House as a result of Arizonian objections. The allocation of power to the various parties to the contract remains the same over the 50-year period.

Legal points now delay action on revised agreement

At last word, the revised documents were awaiting a decision on two questions by the Attorney-General. One is whether Los Angeles and the Metropolitan Water District have power to enter into a contract for Boulder Dam power. Counsel for the Interior Department has decided in the affirmative and it is believed that the Department of Justice will do likewise. The other point relates to the minimum obligation assumed by the contracting parties.

The contractual revisions are said to answer all the points raised by Arizona delegates at the appropriation hearings except the ability of Los Angeles and the water district to enter agreement. Rather than contest these relatively minor features, the Interior Department preferred to make the changes.

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New Hampshire Postpones Associated Gas Probe

THE proposed investigation of the Associated Gas & Electric Company and affiliated bodies by the New Hampshire Public Service Commission (ELECTRICAL WORLD, page 1017, May 24, 1930) will not take place before June 24 by agreement of counsel.

After an all-day hearing on Monday a statutory court of three judges took under consideration the petition of the public utility for an injunction restraining the state body from making a probe of the business of the Associated Gas and the New England Gas & Electric

Companies. The petitioners want the investigation confined to the activities of the New Hampshire Gas & Electric Company and the Derry Electric Company.

This is said to be the first time in the history of New Hampshire that a statutory court session has been held there.

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Great Western Power Plans Interest California Cities

CONTEMPLATED plans for the merging of California power companies, which have long been under consideration, and which received new impetus when the state Railroad Commission approved certain stock acquisitions recently (ELECTRICAL WORLD, page 964, May 17, 1930), are still encountering difficulties.

San Francisco to vote on purchase of distribution systems

The San Francisco Board of Supervisors by a vote of 15 to 3 has approved the recommendation of the joint finance and public utilities committee that the voters of that city be asked to approve at the primary election to be held August 26 the issuance of bonds totaling $68,115,000 to purchase the local distributing systems of the Pacific Gas & Electric Company and the Great Western Power Company, to make necessary immediate improvements and to construct a new power plant. Four bond issues will be placed upon the ballot as follows: For purchase of Pacific Gas & Electric system $44,600,000, for purchase of Great Western Power system $18,945,000, for necessary expenditures (five items) $3,525,000 and for Red Mountain Bar power plant $1,045,000.

The cities of Oakland and Sacramento have filed a joint petition with the California Railroad Commission for a rehearing of the commission's order authorizing the Pacific Gas & Electric Company to acquire the controlling interest in the stocks of the Great Western Power Company, San Joaquin Light & Power Corporation and Midland Counties Public Service Corporation. The petitioners allege that the commission exceeded its jurisdiction in authorizing in effect the transfer of the franchises granted by the city of Oakland to the Great Western Power Company, without requiring the company to obtain the consent of the city. The commission in authorizing the transfer of the stocks in the companies denied permission for the transfer of the properties.

The New York Stock Exchange has approved the listing of 1,825,000 additional $25 par common shares of the Pacific Gas & Electric Company, to be issued in exchange for the North American Company's holdings in California.

File-Tampering Charges Dismissed by Wilbur

FOLLOWING a careful examination by the Department of Justice of the charges made against F. W. Griffith, chief clerk, and F E. Bonner, executive secretary of the Federal Power Commission by Mrs. Minnie L. Ward, file clerk, Secretary Wilbur of the Department of the Interior has shown the allegations to be false.

Mrs. Ward charged that Mr. Griffith had violated Section 129 of the United States Criminal Code by removing and destroying letters from the files of the Federal Power Commission pertaining to the recommendations of F. E. Bonner and Paul S. Clapp for the position of executive secretary; that Mr. Bonner had neglected properly to administer the affairs of the commission, and various other actions.

So much attention was given to these charges by a former employee, suspended for conduct that was indefensible, says the Secretary, that he referred the whole matter to the Attorney-General.

The Senate, on June 2, approved the resolution by Senator Wheeler of Montana requesting the Attorney-General to furnish the Senate with the entire record taken in connection with the investigation of alleged mishandling of Power Commission files.

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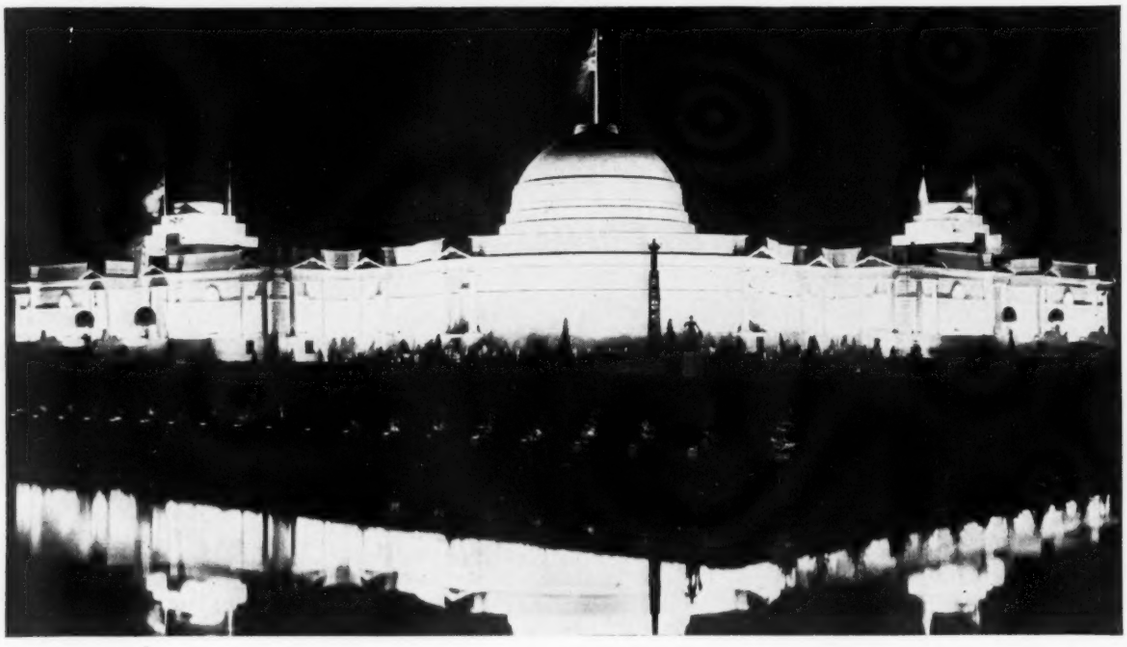
BELGIAN EXHIBITION UNITES THE CENTURIES



This British pavilion at the great Belgian Centenary Exhibition, which opened early last month, is a subtle blending of the old and new day. Constructed on the bastions of one of the old forts of the city, it was designed by Sir Edwin Lutyens, R.A., a famous European architect. It is here shown reflected in the water of the old moat surrounding the fort, effectively floodlighted

Foshay Property Was Long Insolvent, Is Charge

THE Public Utilities Consolidated Corporation was "hopelessly bankrupt" in July, August and September, 1929, Joseph Chapman, receiver, testified in the Minneapolis federal court last week. It was in that period that the Foshay Tower was dedicated in an elaborate ceremony and a loan on securities of Public Utilities Consolidated was negotiated by Mr. Foshay, he said.

A total of $726,907.87 in dividends was paid in the year ended September 30, 1929, on preferred class A and class B stock despite the fact that net earnings of Public Utilities Consolidated Corporation in that period were but $72,283.07, Mr. Chapman testified.

In addition, he said the W. B. Foshay Company owed the Public Utilities Consolidated for that year a total of $515,000. But even with that addition, he declared, the net earnings would not equal the dividends. Dividends on class B stock "should never have been paid," he said.

The stock and bond inventory of the company in July, 1929, totaled $6,948,900, it was further charged. "But I have deducted as worthless from that amount $4,505,232, leaving but $2,443,668, and even that is very liberal," Mr. Chapman declared.

Public Utilities Consolidated Corporation had no earnings on its $7,000,000 worth of property because the utilities plants had not actually been turned over to it, Mr. Chapman declared. "Nothing from nothing leaves nothing," he said. "There was nothing there when I took the company over as receiver and there had been nothing before that."

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Coming Meetings

American Society of Mechanical Engineers, Hotel Book-Cadillac, Detroit, Mich., June 9-12. Calvin Rice, 33 West 39th Street, New York, N. Y.

North Central Division, N.E.L.A.—Managerial Section, Alex. Johnson Hotel, Rapid City, S. D., June 11-12. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Canadian Electrical Association — Manor Richelieu, Murray Bay, Que., June 11-13. H. M. Lyster, 405 Power Bldg., Montreal.

Pacific Coast Division, N.E.L.A.—San Francisco, June 16. S. H. Taylor, 447 Sutter St., San Francisco.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

Association of Iron and Steel Electrical Engineers — Broadway Auditorium, Buffalo, N. Y., June 16-20. John F. Kelly, Empire Building, Pittsburgh, Pa.

World Power Conference—Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Building, Washington, D. C.

Wisconsin Utilities Association — Accounting Section, Eau Claire, June 19 and 20; Electric Section, Lorain Hotel, Madison, July 17 and 18. Commercial Section, Green Bay, July 31 and August 1. J. N. Cadby, 105 Wells St., Milwaukee.

American Electric Railway Association—San Francisco, June 21-26. Guy C. Hecker, 292 Madison Ave., New York.

American Institute of Electrical Engineers—Summer convention, Toronto, June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Haddon Hall, Atlantic City, N. J., June 23-27. C. L. Warwick, 1315 Spruce St., Philadelphia.

Camp Co-operation X — Association Island, Henderson Harbor, N. Y. August 8-12. Society for Electrical Development, 420 Lexington Ave., New York.

Association of Electragists International—Hotel Schroeder, Milwaukee, August 18-20. L. W. Davis, 420 Lexington Ave., New York.

International Association of Electrical Inspectors—Northwest Section, Bellingham, Wash., Aug. 25-27. F. D. Weber, 414 Lumbermen's Bldg., Portland, Ore.

Power Commission Offers Priest Rapids Ultimatum

NOTICE has been served by the Federal Power Commission on the Washington Irrigation & Development Company to the effect that its application for a new license covering the Priest Rapids project on the Columbia River will be canceled July 1 unless the company can make a conclusive showing as to its ability to market 200,000 hp.

Millions of dollars are said to have been expended in an effort to devise some way to utilize the power available at Priest Rapids. Exhaustive investigations have been made of chemical processes, steel making and other power-using activities, but in spite of systematic study no way has been found for the utilization of the smallest block of power that could be profitably produced. In view of these studies it is believed that the construction of this project must await further development of the surrounding territory.

It is believed that the failure to find industries that could make profitable use of power at Priest Rapids is one reason why officials view with some scepticism the claims of Walter H. Wheeler in connection with the establishment of industry on Flathead Lake.

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Farms Served Electrically Increase 21.5 per Cent

DURING the year 1929 the total number of electrified farms in the United States increased from 460,000 to 558,000, or by 21.5 per cent. This, according to the National Electric Light Association, is the largest annual increase so far recorded.

At the end of 1923 there were only 166,140 farms receiving electric service, as shown in the survey which was made by the rural electric service committee of N.E.L.A. Since that time the total number has been increasing at a rate which doubles every 3½ years.

California leads in the number of farms supplied with service by the light and power companies with a total of 72,690 at the end of 1929, representing an electrification of 53 per cent. New York comes next with 53,060, Ohio third with 38,045, and Washington fourth with 37,813.

Montana heads the list for the greatest percentage increase during the past year. On December 31, 1928, the state had only 890 electrified farms, which number increased during the year to 1,844, or by 107.2 per cent. Arizona comes next with a percentage increase of 93.1 per cent, and New Hampshire third with 79.1 per cent.

AIRCRAFT BEWARE!

Pacific & Atlantic Photos

Tall buildings rising in formerly unobstructed areas sometimes need to be marked for the fog- or night-bound airman. The new, and as yet uncompleted, Cathedral of Learning, University of Pittsburgh, is forty stories high, and being not only the highest but also the only high building for miles, this six-tube neon lamp with a 5-mile clear-weather range has been used as an obstruction warning during the construction period

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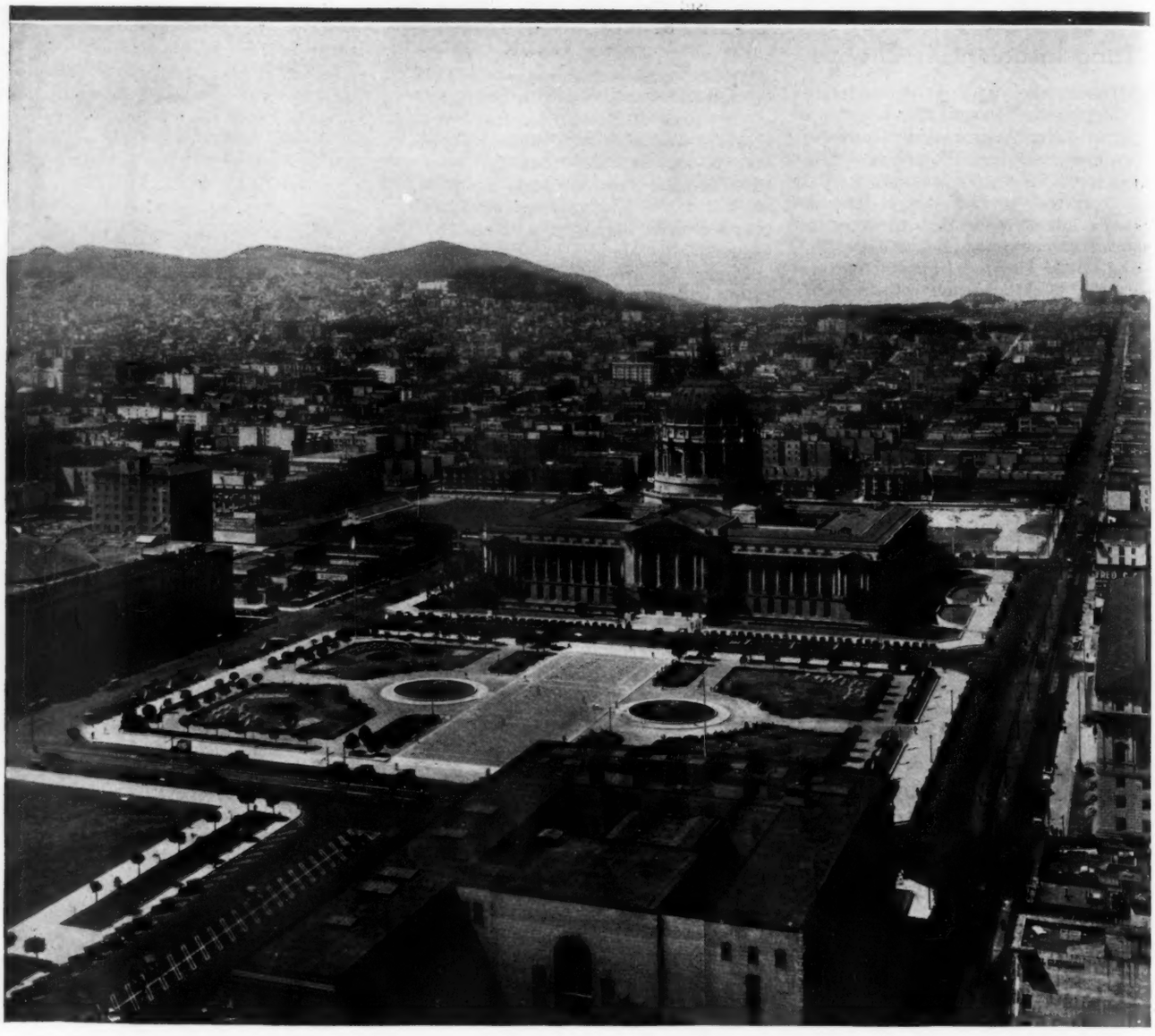

All Roads Lead to San Francisco

WESTWARD HO! The spirit of '49 is reincarnated. But this time the migration to California is in quest of solutions to problems that confront the electric utility industry—regulation, commercial development, public confidence. Already some delegates to the N.E.L.A. convention have left via Red special. Yet a few days Blue and Green specials will depart. And possibly a few venturesome persons with less time to spare from business will fly by airplane. All will assemble at the Civic Center Auditorium.

EDITORIALS

L.W.W. MORROW
Editor

Sales, Engineering, Organization

SALES, engineering and organization are the big three that open the door to further industry progress. They are fundamental. Attention should not be distracted from them by superficial ripples such as political attacks, newspaper agitations that affect public relations, attempts to discredit state regulation and a host of other items inherent from time to time in the activities of a big business affected with public interest.

Extension of services, intensification of services, new services—these three can yield a volume that would dwarf existing business. But how to obtain it quickly and economically? New thought and action in sales and distribution are needed. Tradition must be scrapped, present methods and mechanisms must be remodeled. A realization exists that the present selling practices are wasteful, obsolete and inadequate to meet the needs for rapid and economical business growth. No one can give the final answer as yet to this problem, but it is encouraging to find that the answer is being sought.

NEXT to sales comes the opportunity to reduce costs and improve and extend service through engineering and research developments. Nothing is more fallacious and damaging than the often-heard statement, "The engineering problems of the industry are solved." As a matter of fact, the industry is far ahead of scientific knowledge and research accomplishments; it has been forced to go ahead on an empirical basis. Lightning, dielectrics, thermodynamics, electronics—these terms have an economic and commercial interpretation. Lack of knowledge about them prevents industry progress and penalizes its expenditures. Now, as in the past, the basic economic and service values in the business depend upon good engineering.

AND the third important aspect of the industry is management and organization. The big business is manned by human beings who have been welded together largely upon a historical and expediency basis. As a consequence, there are many variables in organization and in opinions about management functions—there is need for more plan and method in the conduct of the business. The light and power industry can be made a great thing for America if it organizes its manpower intelligently.

The San Francisco convention will give the leadership and instruction to improve sales, engineering and organization, but it is necessary for every man and woman in the industry to organize and put to work the principles and practices necessary to the rendering of good and economical electrical service to America. Today, as yesterday, that is the task of the industry.

An Engineering Appraisal

SELF-DIAGNOSIS, used with discretion, is constructive, and the curative scalpel of Professor Hirshfeld penetrates deeply into the tissues of engineering in his splendid article in this issue. Striking at *status quo* conservatism, he states that the chief function of engineers is to create obsolescence; reaching beyond the technical, he urges engineers to become devotees to humanity. Creators of a machine civilization, engineers must become its operators in greater measure as it is accepted by humanity.

Engineers are accustomed to be preached to and at by their fellows and by outsiders. They are granted such competency as creators and doers in their chosen profession by laymen that an unreal and imaginative conception of competency in all respects is granted them too freely by popular opinion. And their associates, knowing the tangible opportunities that exist for development and improvement in applied science, are apt to accuse them of self-satisfaction and conservatism in technical pursuits and in addition put too great a stress on what they might do if they would devote their attention to non-professional matters of interest to humanity. Most engineers enjoy the sermons, accept credit and blame with equal complacency and concentrate in trying to put two days' work into the one day available.

This is a busy world for engineers. They work under pressure to get results quickly and are the first to recognize that the results they get could be improved upon if time were granted for planning and study. There is not an assembly in a power station, transmission system or distribution system that could not be improved upon, and many pieces of apparatus are as yet imperfect. But there is little time to make design drawings for a complete power station, and if made in detail and all alternatives are studied, the lapse of time required would see advances in the art that would modify conclusions materially. And "create obsolescence" is a catchy phrase that involves some little difficulty when applied to existing investments to which are tied outstanding securities. Yet, after all these technical matters are concluded, the engineer must also shoulder the burdens of humanity.

Seriously speaking, however, engineers can organize and plan their work more carefully and can develop a greater knowledge of and sympathy with the associated activities of engineering business enterprises. They are guilty of too great a concentration on the day's job, too much attention to minute matters, too willing to lean on expediency solutions and have too much distaste for all matters not purely engineering. Organization and study can help them do better work and make them more effective as one part only of a big machine. These are the things Professor Hirshfeld points out and makes tangible in his very able, thought-provoking, motivating article. That is its purpose.

The Status Quo Wins Out in Regulation

PUBLIC surveillance of its utilities has provoked much searching inquiry during the recent political season, but as an institution it remains just about "as you were." Centralization of control and management by holding companies had brought the subject prominently before Congress and the state legislatures. A small group in Congress, groping for an issue over which to excite themselves in the hope that the public would join in the mêlée and make it a merry alley fight, staged an extravaganza that flopped. Some of the states, in general with a higher degree of sincerity and decorum, have been surveying their own accomplishments and limitations in this field. However, out of it all no evidence has emerged to confirm the claim that everything is wrong and that drastic measures are needed.

Theoretical perfection in the economic and legal principles of regulation has certainly not been attained; it may never be. There are too many conflicting interests and inherent factors to hope for an early convergence to a sublimely wise solution. We will therefore have to be content with the present disarray in theoretical regulation. But need we be blue? Not a bit. The chaos has hardly prevented an eminently acceptable practical solution. Electric utilities in growing numbers have awakened to the fact that the determining factors have arranged themselves into

a composite which dictates that low rates and good service are both the right of the consumer and the most lucrative privilege of the utility. With that temper on the part of the regulated vendor a mildly intrusive regulatory machinery is ample to perform its function. That function might well be described as a combination of continuous observation, regular checks, occasional admonitions and, when needed, a parental spanking.

Plan Now for Post-Depression Period

ACCUMULATING evidences of an early return of healthier business conditions bring into prominence the necessity of laying adequate financial foundations well in advance. This is especially imperative in the case of the utilities, with their ever-shifting financial structures.

Easy credit and a favorable money market already have definitely facilitated financing for current needs. In the first four months of 1930 power and light companies sold $45,000,000 of mortgage bonds at prices yielding under 5 per cent. All last year the total sold in this yield class was $25,542,000. Totals for all financing in the first four months are approximately equal to corresponding totals last year in a much more active market.

But present favorable financing conditions will not last indefinitely and it is improbable that advantage can be taken of existing low rates for any length of time. Far-sighted executives are taking advantage of the current situation for future needs some time in advance. This year's program to date has been lopsided in the direction of bond financing and the equity basis must be built up. Then there are still high-interest bond issues and high-dividend paying preferred stocks to be replaced. Add to this merger negotiations and the largest construction program on record, and the result is a picture of the financing program for the balance of the year.

Whatever proportions the year's financing totals finally show, it is safe to predict that senior financing, with "sweetening" in the form of warrants and convertibility, will continue in the lead.

Advertising for Public Relations

DUBIOUS public relations in the light and power industry exist nationally and not locally. Never in the history of the industry have there been better relations than now prevail between local utilities and local communities. This is evidence of good management and good service in local territories. But why does not the sum of these individual situations produce an equally favorable national condition?

The reasons for the questionable national public relations are not very tangible. The scratches of political wildcats, the attacks of some newspapers, the comments of some publicists, the widespread publications of facts and surmises based on the Federal Trade and Federal Water Power investigations and the stock market gyrations have produced a cloud that obscures most of the utility landscape except the "power trust" billboards. These are read by the public. National conditions are not serious and the cloud is perhaps a transient one, but thoughtful leaders do not leave anything to time and chance. Mistakes have been made, lessons have been learned and action looking to the improvement of national public relations is warranted.

National industry advertising is the best answer. If done properly and adequately this is the best approach to national acceptance. This has been proved by the telephone industry and by many others. But the industry must be a unit in this activity, it must do the work on a big scale and it must do it effectively and skillfully. If the copy is not effective it will accomplish nothing; if it is ill-conceived and poorly executed it will result in worse public relations instead of better, and if any unit in the industry does not live up to the copy the entire industry will be subject to criticism.

Advertising is a broad term and the highest specialized talent must be retained to interpret the word in terms of copy. It is no task for an amateur and it is not inexpensive. Advertising must be done effectively, continuously and in volume. The industry will pay in proportion to the advertising volume and quality it will get and it will find that it will obtain an adequate return measured in better public relations.

Rejuvenation of Regulation?

By MATTHEW S. SLOAN

President National Electric Light Association

THE exercise of any government function is attended by difficulties. No law, no administration of law, ever has been 100 per cent perfect. That is, merely to say that human nature is imperfect, is fallible in any of its manifestations.

When government, made up of fallible human beings, undertakes to regulate so complex a business as that of public utilities, also made up of fallible human beings, it is idle to expect perfection in the results obtained. With the utmost good will, with the utmost public spirit, the highest intelligence on both sides, the results are bound to disappoint somebody or a good many people.

It is not surprising, therefore, that there has been an outcry that regulation of utilities has failed. What is surprising is that there has been so little of it. What is significant is that some critics say frankly that if regulation were perfected to the highest point they would consider it desirable only as leading to government ownership and operation of utilities, and others say that no regulation can be worth the cost, because government ownership and operation is the only condition capable of yielding protection from the utilities.

Setting aside the brand of logic which would accept fallible government in operation of utilities because fallible government had failed in regulation, surely a lesser job, I take it there is general agreement that this country has not yet come to want government ownership and operation. What people want, if I am capable of judging, is the knowledge that no private company or interest is bigger than the public, free of public control.

That is, regulation is wanted. Regulation may need perfecting. What laws and administrative functions of government don't? There is no objection to that from the utilities, provided the effort to perfect is not made to include theories untenable, because false economically, or laws which, if held constitutional, would put utilities into a straitjacket and cripple their possibility for future useful service to the public.

The present situation, with utilities grown into great organizations, with large holding company groups interrelated and apparently dominating the field of power supply, with federal and state investigations of utilities and utility laws, contains elements of danger—danger both for the companies and for the public. It is no time for theories or threats by anybody. *It is time to remember two important and inescapable facts.* The first is that there is a basic community of interest between utilities and people, and what is unjust or harmful to either is, in the long run, unjust or harmful to the other. The second is that utility regulation has grown up over many years, law by law, order by order, court decision by court decision, and cannot be thrown down overnight, even with the best of motives.

In this situation there may be help in considering anew the underlying principles of regulation and what it has accomplished rather than confining discussion to a rancorous debate about laws and new laws. I take it that what both elements in this situation are after is the working out of regulation which will be beneficial, not harmful, which will promote utility service and make it more useful, not restrict it or prevent its development in usefulness.

Harmonious relations between state and utilities basis of good regulation; not law. Application of principles not a cut-and-dried legal problem. Constructive suggestions for improved conditions

Harmonious relationship between state and utilities the basis of regulation

A summing up of the basis of regulation was made recently by Colonel Donovan, who was counsel to the New York State Commission on Revision of the Public Service Commission Laws.

"The true philosophy of regulation," said Colonel Donovan, "lies in an appropriate harmonious relationship between utilities and state. This can only come from an established basis of mutual confidence. In my judgment, a kind of legalized war against the utilities, like all warfare, will end in economic waste. There are but two alternatives which must be faced: Either ownership and operation by the state itself, with whatever evils may attend it, or else acceptance by both the state and the utilities of definite standards of social justice."

What is this appropriate harmonious relationship? How should a basis of mutual confidence be established? And what are the definite standards of social justice which must be accepted?

I believe utilities, as a business impressed with a public interest, owe an obligation to the people somewhat heavier than ordinary business, but that nevertheless they are private business, their capital devoted to a public purpose. I believe, therefore, that they need to consider, endeavor to define and live up to standards of social justice, if such can be ascertained. I can draw up standards of operation for the utilities and the people which seem just to me. They may not seem just to others.

I believe utilities should supply the highest standards of service possible in the conditions under which they operate, and those conditions—the nature of their territory, their human, physical and financial resources—would have to be considered. They should keep their plants and equipment scientifically up to date. They should endeavor to meet the needs and desires of the people and the communities served. They should use commercial enterprise in extending the number of uses and the sales of service. They should co-operate with public spirit in good citizens' movements and community development undertakings. They should pay their employees well and provide properly for advancement and for insurance, retirement, sick benefits, and the like. They should charge prices which will keep them prosperous and attract new capital for extension, but should not profiteer.

I believe the state should regulate utilities to make certain that their service will be modern, progressive, making due allowance for individual conditions. It should make certain that they receive, if they can earn it, sufficient income to keep them prosperous. Otherwise they cannot be good and desirable workmen. It should not allow them to

Square Deal Standards for Regulation

Utility Obligations:

1. Utilities should supply the highest standards of service possible in the conditions under which they operate.

2. Utilities should keep their plants and equipment scientifically up to date.

3. Utilities should endeavor to meet the needs and desires of the people and communities served.

4. Utilities should use commercial enterprise in extending the number of uses and the sales of service.

5. Utilities should co-operate with public spirit in good citizens' movements and community development undertakings.

6. Utilities should pay their employees well and provide properly for advancement and for insurance, retirement, sick benefits, and the like.

7. Utilities should charge prices which will keep them prosperous and attract new capital for extension, but should not profiteer.

State Obligations:

1. The state should regulate utilities to make certain that their service will be modern, progressive, making due allowance for individual conditions.

2. The state should make certain the utilities receive, if they can earn it, sufficient income to keep them prosperous.

3. The state should not allow utilities to profiteer if they try to.

4. The state should check the honesty and accuracy of utility accounts and financial transactions.

5. The state should have access to all information necessary to form an estimation of the propriety of utility prices.

6. The state regulatory processes should be fair—that is, free from personal or political bias and rancor—and intelligent—that is, free from economic error.

7. The state regulatory processes should be simple, so that they might be reasonably prompt and as little expensive as need be.

profiteer, if they try to. It should check the honesty and accuracy of their accounts and financial transactions. It should have access to all information necessary to form an estimation of the propriety of their prices. Its regulative processes should be fair—that is, free from personal or political bias and rancor—and intelligent—that is, free from economic error. These processes should be simple, so that they might be reasonably prompt and as little expensive as need be.

These elements, it seems to me, properly constitute the basis for appropriate and harmonious relations. They are, in my opinion, definite standards of social justice, assuring, as they are lived up to, a square deal for customers and utility both. They are, in the main, the principles written into the laws under which regulation is now carried on.

Application of principles not a legal problem

It is in the application of these principles that difficulties occur, and they occur because human beings are human beings. They have individual points of view, individual standards of ethics and conduct, individual ideas of what constitutes public spirit. Laws become necessary to formulate requirements for standards of performance. These laws themselves are human creations. Moreover, they are subject to interpretation by the courts. There is bound to be uncertainty in some respects. There is bound to be delay. Where there are differences of opinion and litigation, somebody is bound to be licked. Consequently, somebody is bound to feel disgruntled at the operation of the system.

In practical fact there is only one point of serious difficulty between the utilities and the public in utility regulation today. That is the matter of rates. Matters of service seldom come to an issue. The utilities, as good business practice, and from professional pride, exert their utmost efforts to make their service safe, certain and satisfactory. Service is what the companies have for sale, and if it is not as salable as it should be and as the customers believe it ought to be the utilities want to know it more than anybody else does, so that it may be improved, if possible. Some utilities have spent money advertising for complaints, a company of which I have been president for many years among them, in order to find out if there are opportunities for betterment of service from the customer's point of view.

As to rates, the situation is quite different. Everybody would like to buy everything used at lower prices. Electric current cannot be seen. It is put to work without the knowledge by most people of how much is required to do a particular piece of work. It is measured by a device, in the accuracy of which some people have no confidence. It is charged for, not in pounds or yards or by the piece, but in terms which might as well be Greek to thousands of users. Profit is involved with rates, and a good many people have the chronic idea that utilities make much too much money. The net result is a broad disposition to believe that electric rates, whatever they are, ought to be lower, and there is never any lack of support for regulative effort or political clamor to lower them.

Nobody on earth can set an accurate price on anything. Acceptable prices, fair prices, reasonable prices may be made. They must be changed from time to time, as business costs and market conditions vary. Social justice and the laws, as I understand them, require utilities to supply their service at fair prices.

There are two tests which may be applied. One is a business test:

> **Can the utility company, at its existing scale of rates and with its existing costs, obtain revenue sufficient to pay its obligations, maintain its service in prime condition and readily get new capital for service extensions?**

If it can, the rates are not too low. Can it readily increase the number of new customers and the volume of sales to existing customers? If it can, the rates are not too high. Can the utility by lowering its rates stimulate its growth and the use of its service without endangering its financial position? If so, it should.

The other is a legal test:

> **Will a given scale of rates, with existing costs, yield a rate of return which the courts will declare not confiscatory of the utility's property and still not excessive?**

If they will, the rates are legal. They may or may not

be fair or reasonable from the business point of view and in the abstract light of social justice.

It is the application of the legal test which makes all the trouble. Now that test is part of the system of utility regulation, a part of the law of the land, and I believe it is necessary and inescapable that it be there to be appealed to in emergency. Appeal to it, however, whether by public officials or utilities, is proof positive that there does not exist an appropriate harmonious relationship between utilities and state. The long-drawn-out litigation which must follow, with its disputed valuation claims, is as far from harmonious relationship as anything could be. Such litigation is the basis for a vast proportion of assertions that regulation has broken down.

Too much emphasis on legal aspects

I believe far too much emphasis is put on the legalistic aspect of rates, valuation and all elements which enter into rate cases—too much for good business and too much for social justice. What the utility operator is interested in, what the utility investor is interested in, is not a legal rate base or a legal stated rate of return, but the number of dollars left after obligations are paid. What the consumer is interested in is the rate per kilowatt-hour in cents and the amount of electricity he can afford to use. The reasonable rate, the rate which is reasonable for company and the rate which is reasonable for consumer, is a rate which will leave the company sufficient dollars in the treasury to have it recognized as a sound and profitable concern, and at the same time promote a free use of current by consumers.

The intelligent operator, if his treasury is getting too fat, is going to reduce his rates, both on the grounds of social justice and on the ground of good business sense, because thereby his company's prestige will be enhanced and his business be increased. He will do this even if the company earns below what ordinarily is considered the legal rate of return on valuation provable to the court's satisfaction. Many electric utility operators have done so. I think that in all probability a majority of the electric companies are now earning less than a legal rate of return, but they are not insisting on having it, because to do so would cost more than it would be worth in customer good will forfeited and sales increase stifled. When, unfortunately, by regulative order or public clamor, a company faces a rate reduction which in all probability would starve it, it feels obliged to fight. With the enormous technical improvements and the managerial and financing efficiencies so widely applied in the electric field in recent years, such cases are very few.

Not a mathematical process

We have recently had suggestions, even proposed legislation, for mathematically calculated rate bases. We have had similar proposals for valuations worked out and ratified by contracts between utilities and public authorities. These would get us exactly nowhere in advance of the present system, in my judgment. There would still be variables. There would still be litigation on the head of them. There would still be dissatisfied litigants. The machinery of regulation can and will be improved, and should be improved in respect of making it simpler and quicker in operation. The ethics of utility executives and public officials both may show development and their policies and acts come nearer to abstract social justice, which would be most helpful. But I doubt whether in our lifetime or our children's the system of regulation and laws on which it is based will be reduced to mathematical processes. I am forced to doubt the possibility of attaining an ideal state in regulation, and if we could be translated overnight into it, I am sure many would still be dissatisfied.

With regulation as we have had it, I know vast benefits have resulted to utilities and to the public they serve. I believe its principles are sound, though human, and its administration no more fallible than other human enterprise. I am sure it will be improved in its application to changing conditons as it should be, but I don't look for a regeneration of human nature this year, or even next year. Therefore I fear there will continue to be a "utility issue" with us for some time to come.

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Westward Ho!

By A. F. HOCKENBEAMER

President Pacific Gas & Electric Company and General Convention Chairman

THE West Coast has been the proving ground for high-head hydro-electric plants, 220,000-volt transmission, the electric range, electric water heating, electric house heating and customer ownership.

We feel that our engineers, our commercial men and our executives have fully met the many engineering, load building and financial problems that have confronted them.

We believe that our Eastern visitors will profit by a closer contact with our problems and the men of our industry, and may I extend to all who journey to the city by the Golden Gate the hand of Western hospitality.

Working Shoulder to Shoulder

With Agencies for Regional and City Development

WHAT might be called good corporate citizenship offers a power company the opportunity to contribute to community and regional growth in a broader way than through the cultivation of its own business, essential as that is to community well being. Such contributions represent substantial material outlays, but their greatest value probably lies in the service rendered by the highly trained and experienced personnel of the power company to movements for industrial and business expansion.

For many years membership in local chambers of commerce and similar organizations has helped utility men and other citizens of local business communities to know and understand one another better, and it is a natural step from these friendly relationships to participation in larger movements of regional projects.

These movements are primarily designed to stabilize and increase the prosperity of areas represented in their membership. In the case of the Boston Edison company, they include co-operation with business organizations in regard to industrial development, the discussion of interconnection, interstate power problems, regulation, farm power extensions, surveys, city and town planning, smoke abatement, participation in public celebrations, traffic control and safety practices.

Our co-operation along these lines focuses chiefly in our relation with the New England Council. This interesting and useful body was organized in 1925 as a kind of economic parliament to promote intelligent understanding of New England's assets, purposes and progress throughout the country. The council consists of twelve business and industrial leaders from each of the six states, or 72 altogether, elected by the agricultural, commercial and industrial organizations in each state to carry forward the movement. From the beginning, the power companies gladly have shared in this plan to promote economic development through co-operative activities. Executives of the power industry serve as chairmen and members of important committees named by the council and assist the council through utility staff service representing a wide range of specialized personnel.

Building industry through team play

The most effective co-operation which the Boston Edison company renders to the development organizations is achieved through committee work and membership. In the New England Council, for example, the power companies are in direct contact with the following committees: Power, agricultural, and community development. A co-operating power committee, composed of five executives of the power organizations operating in New England, represents the electrical industry and aids the council's power committee to the fullest extent. A farm power committee composed of four public utility men and two agriculturists, co-operates with the power and agricultural committees of the council. An industrial development (power) committee, composed of six utility men, co-operates with the council and its committees as required, also working through the community development committee of the council.

Industrial development movements are initiated rather than executed by the council, so that utilities which have organized individual development departments, either as a result of their own programs or through the good offices of the council, carry on the detail work of co-operating with the building up of local industry, mainly through local chambers of commerce and boards of trade. Some 109 power companies in New England now maintain industrial departments or promotion departments which co-operate with these local business organizations and give valuable advice of an economic and engineering character in connection with the migration of industry, the retention of existing factories in the territory and the entry of new manufacturing organizations into the New England territory.

The counsel of an organization like the Boston Edison company is particularly helpful to chambers of commerce which are obliged to work under very limited budgets. The promotion division of the company is con-

By CHARLES L. EDGAR

President Edison Electric Illuminating Company of Boston

tinually preparing information for some progressive chamber secretary, and in one case recently made available to a local chamber for two weeks the services of one of its co-operative students who devised the presentation of local statistical data. Few suburban chambers of commerce maintain paid secretaries.

Characteristic of the work done with established industry is the case of a suburban manufacturer who had decided to close his plant and consolidate operations in New Jersey, because of a presumed unfairness in his local tax assessment. The matter was immediately taken up by our promotion department with the Commissioner of Corporations and several conferences resulted. There is every expectation at this writing that the matter will be adjusted and that the manufacturer will remain in Edison territory. The difficulty in this case arose through the adoption in making out the tax return by methods of valuation not usually employed in the United States. The familiarity of our promotion department with normal tax return practice enabled the Edison company to aid the manufacturer to take the necessary steps to secure a thoroughly warranted rebate.

In common with other utilities, this company is constantly co-operating in industrial survey work and providing detailed and exact information for manufacturers considering the establishment of plants in New England. Data bearing upon available land, raw material, waterfront privileges, transportation facilities, restrictions, cost of power, concentration of allied lines of manufacture in specified areas and other factors affecting the decision to locate or migrate are covered in this work.

The consequences of impending tariff changes in this country moved the largest exporter of cast-iron pipe in Europe from France to the United States to acquire a location on the Atlantic Coast for future development. The formation of an American subsidiary resulted in its purchase of a large tract of waterfront property in Chelsea. Although the property will be used for storage at present, it will be developed for manufacturing the cast iron produced at this point for the Eastern market. Following the purchase of the land, suggested as advantageous for the French company by the Edison company's development division, it was necessary to work with the city authorities in Chelsea to prevent any possibility of the property being zoned against unlimited manufacturing purposes. Such are typical examples of the ramifications of the work done by the company in co-operation with industrial development activities.

Co-operation with municipalities

The company actively assists in the installation of traffic signals in the various communities, more as a good-will movement than for financial increment, since the profit to the company from this type of business is very slight.

The complex problems of traffic control require experienced judgment and careful study, which is supplied by the company to each community. Where traffic signal equipment is installed and maintained by the company, perfection in operation is guaranteed and the municipalities are billed only for actual costs incurred. Installation of equipment is supervised by Edison engineers, who are equipped to render a service which many communities cannot afford to obtain from other sources.

During the year special studies were made on 50 traffic intersections, 31 of which have already been accepted and the equipment installed.

Smoke abatement

Co-ordinating our efforts with various civic organizations toward the investigation of air pollution, the company has established at various points througout the territory a series of twelve dust-collecting stations.

There has been organized during the past year a division within the company which visits these stations, collects the dust content weekly and delivers it to a representative chemist, who analyzes the samples and reports the results of the analysis. In this way the company has reliable facts with which to work in its endeavor to help solve the air-pollution problem. This procedure is the result of complaints received from certain sections within the company territory of annoyance caused by coal dust, smoke and cinders.

The general tendency in the state is to make the smoke law more rigid. Representatives of the company have convened with representatives of civic organizations, industrial organizations and other public utilities, and have given their general support to framing a bill satisfactory to all which is to be presented to the State Legislature for its consideration.

Enlarging the activities of the year previous, three men from the Harvard Business School were employed

MR. EDGAR'S comments on co-operation with civic and other developmental bodies suggest a parallel between the modern distribution system and the increasing lines of communication between personnel in utilities and chambers and councils for business building. Such a network for economic service ramifies over a surprisingly large field of interest, and besides bettering public relations is a substantial factor in maintaining sound industrial development and stabilizing load conditions through the application of specialized knowledge.

last summer in making special industrial research studies. Four complete studies were made and represent the first promotional work of this nature ever done for New England.

The Business School rated the studies as the best that had ever come to its attention and was willing to contribute further studies by the school itself. Under the arrangements which have been made, three second-year students have been assigned to the development division and, under the direction of one highly experienced man, further studies on special industries will be made.

Massachusetts Industrial Commission

The creation of the Massachusetts Industrial Commission by the General Court furnishes an additional agency to assist in industrial development. In addition to offering the facilities of the division to the commission, twelve specific recommendations for future activity by that body have been given to the executive secretary.

Through the co-operation of the utilities with the New England Council and other organizations, the significance of interconnection as a factor in regional welfare has been made clear, and a working arrangement effected for the voluntary regulation by state commissions of interstate power contracts. At intervals a leading executive of the power industry has addressed gatherings including prominent industrial and business leaders of New England upon the growth of interconnection in these states, the benefits of tying coastal steam plants and interior hydro-electric plants together for the most economical operation and use of capital, and upon the broader trends of the power industry in this region. The New England states are as far advanced as, if not ahead of, any other section of the country in the matter of interconnection between companies. Interstate transmission of electricity, it has been shown, can be regulated by the commissions of the participating commonwealths without need of federal regulation, and in establishing this *modus operandi* the utilities, and the developmental body which served as its vehicle, achieved a co-operative step likely to become of far-reaching significance.

Farm power problems clarified

To meet the widespread desire of power companies and agricultural organizations to solve rural service problems co-operatively, a basic extension formula was worked out in conjuction with the New England Council's farm power committee, and this formula has been accepted in a number of cases as a working arrangement. Experimental and test installations of electrical equipment have been operated for several years on selected farms through the co-operation of the Boston Edison and other utilities

"He Who Serves Best Profits Most"

By A. W. LEONARD

President Puget Sound Power & Light Company

IN 1922, when the Puget Sound Power & Light Company embarked upon its rural electrification program, little did it realize that in aiding the farmer in solving his production problems through the use of electricity the truth of the old adage, "He who serves best profits most," would be brought strikingly home. Making its service available to the farmers of western Washington has resulted in a remarkable increase in the annual net income of the farmer. The company has benefited from the community development and, in addition, is earning a fair return on its investment in the rural business.

The company has spent approximately $4,133,000 in building 4,133 miles of rural lines to serve 52,093 customers. Through the good work of our rural electric service department we have developed many new electrical devices for use on the farm and have brought our farm customers up to an average consumption of 1,502 kw.-hr. per year and average annual revenue to $49.92, making the average rate 3.32 cents per kilowatt-hour.

We do not discourage small-revenue-producing appliances, but instead endeavor to aid the farmer and the farmer's wife in every possible way to lighten the burden on their shoulders. In so doing we feel that we are fulfilling the power company's obligation to the farmer and at the same time we are benefiting both directly and indirectly.

with the agricultural organizations and educational institutions, and much has been learned as to the place of electric service on the farm. Utility staffs have been strengthened by the addition of specialists in this field.

Utilities favor co-operation

One may sum up the co-operative outlook among New England utilities with regard to development movements with a sense of gratification that wide acceptance of the value of such promotional work now prevails. Survey work of lasting usefulness has been conducted recently by the New England Public Service Company operating in Maine, New Hampshire and Vermont; the New England Power Association, and others. Important aid has been given under Walter S. Wyman's direction to industries in northern New England which have been facing difficult problems of readjustment to meet changing conditions. While competition among local business organizations to secure new industries and encourage the growth of established ones continues keen, and while progressive power companies are naturally desirous of building industrial loads for permanent prosperity, the spirit of co-operation among the utilities and between the utilities and the local and state developmental organizations is in general healthy. There is a disposition to compete for business on the basis of sound economic analysis, so far as the utilities are concerned, and this speaks well for the industrial future of New England.

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THE DOMESTIC LOAD—500 Kw.-Hr. or 4,000?

AS A potential market for electrical energy the American home continues to hold out possibilities far in excess of present achievement. Great as has been the progress during recent years in the domestic use of electrical energy, there is reason to believe that it will appear small in the light of what the future will bring.

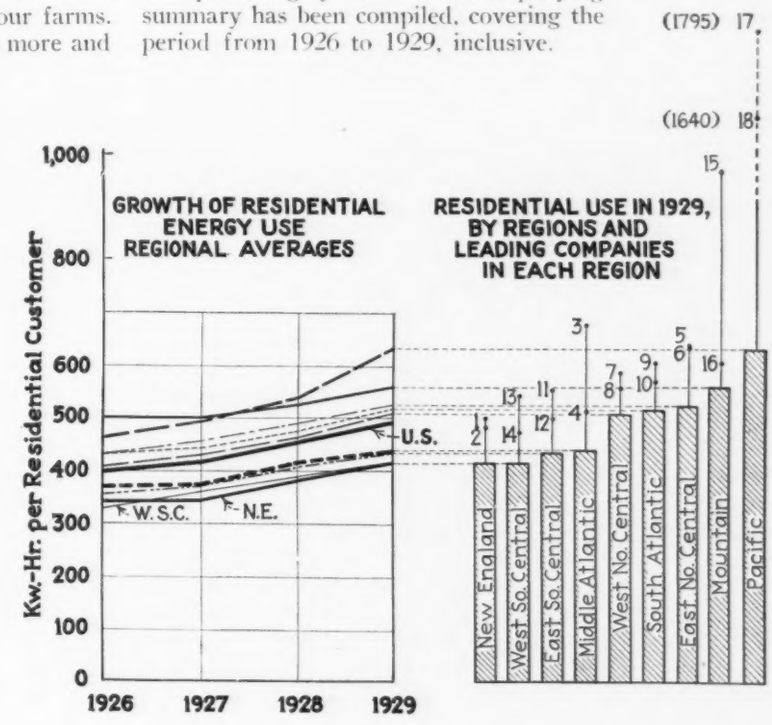
Residential users constitute 70 per cent of the families in the country; they include virtually the whole of our urban population, most of the inhabitants of the smaller villages and a fair fraction of the dwellers on our farms. Growth in residential energy sales is becoming more and more a matter of increasing the use per customer rather than adding to the number of customers, although the drift to the cities and the extending of lines into new rural areas will continue to bring hundreds of thousands annually for years to come.

A view of the present status is afforded by the tabulation of operations of major systems during 1929 published in the Supplement to the ELECTRICAL WORLD of May 3, 1930. From that and from corresponding figures for preceding years the accompanying summary has been compiled, covering the period from 1926 to 1929, inclusive.

From 400 to 493 kw.-hr. in three years. One company nears 1,800 kw.-hr.

Companies indicated on the chart are:

1. Hartford Electric Light Company.
2. Connecticut Light & Power Company.
3. Duquesne Light Company.
4. West Penn Electric Company.
5. Northern Ohio Power & Light Company.
6. Detroit Edison Company.
7. Kansas City Power & Light Company.
8. North American Company Mo.-Ill.-Iowa System.
9. Georgia Power Company.
10. Consolidate Gas, Electric Light & Power Company of Baltimore.
11. Alabama Power Company.
12. Memphis Power & Light Company.
13. West Texas Utilities Company.
14. Houston Lighting & Power Company.
15. Idaho Power Company.
16. Montana Power Company.
17. Washington Water Power Company.
18. California-Oregon Power Company.



The reporting companies generated, in 1929, about 88 per cent of the total energy for the central-station industry; although there have been some changes of name and some regrouping of properties during the four years, the population served has been essentially the same, except for normal growth.

The regional and national averages are therefore typical of the industry, differing but slightly from the figures that would be obtained if all the smaller companies could be included; the trend is clear. It is evident that—

1. As disclosed by statistics for the larger systems, our average annual residential consumption per customer is close to 500 kw.-hr. Regionally it ranges from 415 kw.-hr., in New England and the West South Central States, to 635 kw.-hr. in the Pacific States.

Kw.-Hr. per Residential Customer, by Geographical Regions, for Major Systems

Based on Data in Spring Supplements with Estimates for Companies Giving Incomplete Segregation

Region	1926	1927	1928	1929
United States	**400**	**416**	**452**	**492**
New England	342	348	380	415
Middle Atlantic	368	374	413	441
East North Central	430	453	488	526
West North Central	404	426	458	501
South Atlantic	431	445	474	520
East South Central	351	374	407	440
West South Central	328	362	384	415
Mountain	500	500	522	556
Pacific	461	494	539	635

The averages used in the table and chart of this article were computed by dividing the kilowatt-hours for the year in question by the number of customers at the *end* of the year. It would have been more accurate to divide by the *average number* for the year, but this number was not available by regions and, in many instances, not by companies.

2. There has been a material increase in the average annual energy consumption per domestic customer; for the country as a whole the average was 23 per cent greater in 1929 than in 1926; in the Pacific group of states 37 per cent.

3. The West outranks the East as to average individual sales; the highest figures in the United States are reported by Western companies operating mainly on water power.

4. In every geographical region there are wide variations between companies, some of these far overshooting the regional average. The extreme case is that of the Washington Water Power Company, with nearly 1,800 kw.-hr. per domestic customer, not far from three times the regional average for the Pacific States, and approaching four times that for the whole country.

Some systems may have larger unit sales than the statistics reveal. It is not uncommon to sell energy for heating and cooking separately from that for lighting and small appliances. Where the reports do not include the former as a part of the residential consumption the computed average per customer is obviously too small, but there usually is no way of determining the correction to be applied. The difficulty does not arise where all the energy is metered together.

A second discrepancy arises from lack of uniformity in stating the number of customers. Some reports give the number of monthly bills, some the number of meters; some count a customer twice if he is billed separately for lighting and for heating, others count him but once. So long as this lack of uniformity persists the returns will not be strictly comparable as between companies. The trend from year to year, however, is not obscured.

Load building without revenue building

The experience of a good many companies has been that while energy consumption has climbed steadily, rates have come down, and the revenue per customer has continued to hover around $30 a year, with only a slight upward tendency.

A few cases of purely local averages running to 3,500 kw.-hr. or higher have been reported. Generally they are associated with a hydro-electric supply not burdened with the expense of maintaining a steam reserve, underloaded, and faced with the need of building up consumption by all possible means. Residential rates had to be offered that were as low as those commonly charged for wholesale power, or lower. Questions of taxation and municipal financing also enter.

While these exceptional instances may afford little information immediately applicable under ordinary operating conditions, they do point the way toward future developments.

Data of more value will come from the experience of successful companies having high system averages, and certain local averages that are still higher. When the latter can be studied in detail, worth-while figures will emerge.

The present problem is to continue extending the use of electrical energy in the home, particularly for heating and cooking, but at a price that is economically sound. Only careful analysis will show the solution. Progressive utilities are already at work on it. It calls for the same sort of study as the purely engineering problems that have been successfully mastered.

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Another 100,000,000-Kw.-Hr. System

TO THE 137 systems in the United States in the Supplement to the ELECTRICAL WORLD of May 3, 1930, that of the Public Lighting Commission of Detroit, Mich., should be added, with the following statistics for 1929:

Fuel-burning plants (1)		80,000 kw.
System peak,	instantaneous	47,000 kw.
	30-minute	44,000 kw.
Kilowatt-hours	generated	175,536,000
	Purchased	15,364,800
	Total output	190,900,800

Of this output 3,840,000 kw.-hr. went for commercial lighting and small power to seven customers and 170,460,800 kw.-hr. was used for municipal service, including electric railway operation, the losses therefore being 16,600,000 kw.-hr.

This brings the total number of 100,000,000-kw.-hr. public utility systems in the United States to 138, with 1,741 plants, having an aggregate rating of 25,991,781 kw. and a generated output during 1929 of 81,736,881,767 kw.-hr. The number of systems in the East North Central States becomes 32, with 302 plants, 6,247,787 kw., and 19,131,372,552 kw.-hr. generated output.

The Customer Sets His Rate

Use of service and not regulation the basis of costs. Building for load factor essential. Sales function of industry predominates

By MARTIN J. INSULL

President Middle West Utilities Company

HOWEVER zealously the viewpoint of the customer is studied by the electric light and power industry, it is not certain that the importance of the customer's rôle is yet fully appreciated. In the field of domestic consumption, at least, it may safely be said that the customer in reality controls the cost of providing his electric power service. I am not thinking here of the control of price exercised through regulatory bodies, but rather of the effect on costs of the consuming habits of the people who compose the huge domestic market for electric service.

The electric industry provides efficient generating stations; it also provides facilities for the efficient transmission and distribution of the energy produced. Its efforts to reduce costs in these respects are continuous. Yet this cannot affect domestic rates as greatly as they are affected by the nature of the consumption—its volume, its distribution over the hours of the day and the density of the market.

It is, indeed, for the customer to say whether his service shall cost him 15 cents or 5 cents per kilowatt-hour. If he chooses to restrict his use of electricity, the so-called overhead charges necessarily included in the price for initial use will result in an apparently high charge for the service. Yet it is a familiar fact that much of this charge really reflects the cost of reading meters, making out bills and other necessary operations besides the actual delivery of electricity.

The possibilities of furnishing electric service more cheaply reside principally where the power is used—not where it is produced. The equipment on the customer's premises is an integral part of the electric system. His investment in electric wiring and equipment, in fact, exceeds that of the electric industry. The system is put into operation when the customer throws a switch, and it is this action on the part of thousands of customers that determines the degree of efficiency at which the system can be operated. The throwing of these switches is simply an expression of the consuming habits of the public. These habits are determined to a large extent by the extent to which the industry has convinced the customer of the value of electricity and the extent to which it has guided the growth of consumption from the standpoint of load factor.

Especially important—in a business whose investment per dollar of income is relatively so great—is the question of *when* the service is demanded. The importance of load factor can never be stressed too much. A successful commercial job of guiding the consumer's use will consider the distribution of the demand over the hours of the day quite as carefully as it considers the increase in the volume used. The customer affects his rate not only by the amount of current he uses, but also by the time at which he uses it. In this business it is, if anything, more important to distribute the load evenly over the day and over the seasons than it is to increase the load, because it is conceivable that an increase in demand at the wrong times could either jeopardize the investment or cause an unusually high rate. The price charged for electric service responds very sensitively to the consuming habits of the users, and the companies are called upon for a high degree of leadership and guidance in encouraging a demand so distributed as to react properly on the cost of providing service.

The commercial function of the electric light and power business, viewed from this consideration, turns into an operating function. In other words, the sales

of the service largely determine the cost of producing it. Load building must receive a corresponding degree of emphasis.

There is no lack of appreciation of this characteristic of the electric light and power business, but, on the other hand, there is room for a greater realization of the need of cultivating an appreciation of this fact among the people who use the service.

A highly necessary phase of this commercial activity is a properly designed rate schedule which recognizes the importance of encouraging increased use and of giving the customer an incentive to make greater use of the service. I think this can be demonstrated by some statistics taken from the operations of a group of companies serving widely separated territories and in most cases relatively sparsely populated areas.

As a consequence of the incentive rate and of reductions in the price at each step of the rate, the average domestic rate per kilowatt-hour has declined approximately 20 per cent in four years. The consumption per customer has increased in the same period from 305 kw.-hr. to 419 kw.-hr., resulting in an increase of $4.55 in revenue per customer.

Customer and utility gain through proper rate schedules

The average customer used 38 kw.-hr. more in 1929 than in 1928. He paid $1.48 for this additional service. His additional use, therefore, cost him not quite 4 cents per kilowatt-hour. This group of companies served approximately 1,000,000 domestic customers. The annual cost of the increased use, if the incentive rate were not in effect, would have been more than $3,100,000, whereas under the incentive rate the companies actually received only $1,500,000 for it. Thus there was a reduction of $1,600,000 in the price to the customers for the additional use, which certainly was caused to a large extent by the incentive form of rate. Furthermore, a substantial portion of the $1,500,000 additional revenue naturally was net income to the companies. Both company and customer, therefore, have received marked benefits from this trinity of properly designed rate schedules, advertising efforts and merchandising activity.

I have seen "5-cent electricity" demanded by critics of the electric light and power industry. Here it is an accomplished fact. But it is possible only when the customer is persuaded to do his indispensable part in making it possible.

To say that the customer controls cost, however, is not to relieve the companies of their responsibility of guiding the customer in his use of electric service. It is clearly their duty to make appliances readily obtainable and to make available to the customer the results of their studies of the maximum usefulness of electricity. And, in practice, the increased consumption is generally brought about after the companies have taken the initiative in reducing rates, depending on an increase in consumption to justify it. Almost invariably this increase in consumption materializes, provided the rate revision is accompanied by adequate publicity and aggressive merchandising.

Of what further use can electric power be to the people of this country and what can those of us who are engaged in this business do to extend the usefulness of electricity? In the answer to this question will be found the success of the industry and the maximum benefits to the people who use the service.

A still greater commercial-mindedness on the part of the industry is important. Commercial-mindedness infers that the industry will extend along commercial lines in the sense that it will require each new step to justify itself commercially; to pay its way. To develop the business on any other basis would be to burden some users with the cost of serving other users and ultimately to imperil the service of all users. The industry does not demand, of course, that every extension of its service be immediately feasible commercially, but it knows that it must make it so eventually.

The "commercial" viewpoint also implies an aggressive spirit which is the exact opposite of a standstill institutionalism, and that is a factor of tremendous importance. A failure to recognize fully the importance of the industry's commercial or selling function is a failure to realize two things which are of extreme importance to the industry: First, that consumption determines our cost of doing business; second, that it is the selling function that, in nearly all cases, strikingly differentiates an alert, expansive, ambitious enterprise of individuals from a solidified and cumbersome governmental organization. It is that attribute of so-called private business that has enabled the electric light and power industry to make its outstanding contribution to the nation's well-being and progress.

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Rural Utilization Factors as Found in California

AS PART of a field survey reported upon in the joint bulletin of the University of California, division of agricultural engineering, and the California Committee on the Relation of Electricity to Agriculture, the accompanying tabulation indicates rural utilization of energy factors for that state.

AGRICULTURAL CUSTOMERS, CONSUMPTION, CONNECTED LOAD AND REVENUE FOR 1923 TO 1928

Taken from Reports Made to California Railroad Commission

	1923	1924	1925	1926	1927	1928
Number of consumers	28,778	33,258	37,907	43,786	47,416	49,067
Total revenue	$8,300,603.22	$9,957,163.76	$10,821,619.05	$12,456,981.97	$11,978,718.64	$14,303,589.50
Kilowatts, connected load	352,706	405,011	465,711	518,841	553,074	591,538
Kilowatt-hours consumed annually	485,115,972	666,388,330	709,532,139	842,143,641	754,536,197	956,262,225
Connected load per consumer, kilowatts	12.28	12.1	12.32	12.15	11.69	12.02
Annual consumption, kilowatt-hours per consumer	16,891	20,562	19,199	19,236	15,913	19,480
Price per kilowatt-hour, cents	1.71	1.47	1.49	1.48	1.59	1.41
Kilowatt-hours per kilowatt connected load	1,383	1,657	1,536	1,603	1,350	1,616

Values in Engineering

By C. F. HIRSHFELD

Chief of Research Detroit Edison Company

WHEN engineering is mentioned in connection with electricity supply undertakings one thinks immediately of generation, transmission and distribution. This is probably natural because of the fact that this is what the engineers of the industry have themselves stressed in their organizations and in their discussions. The fact that utilization also rests on engineering appears to be generally overlooked, possibly because the persuasion to utilize has been regarded as the important factor and the engineering involved has been viewed as of very secondary importance.

Considering the matter in a broad sense, the activities of electricity supply companies rest on a number of supports, as do most other large and complicated businesses. The activity as a whole would be either impossible, or at least very imperfectly conducted, if one or more of these supports were eliminated. Engineering pervades the whole structure and is a necessary part thereof. So does financing, so does purchasing, so does selling, so does accounting, so do many other things. Therefore, if what follows is devoted only to engineering, it is because of the fact that the editor, probably knowing his man and acting wisely, as good editors have a habit of doing, directed that the author's present effort should be confined to that field. Certainly the latter has no inborn or acquired conviction to the effect that the engineer and engineering are of themselves and by themselves sufficient unto the industry.

Until quite recently the engineer has not gone very far in asking himself just how well he was doing his part of the job. In fact, he has been so busy keeping up with the multitude, magnitude and ever-changing variety of the problems presented him that he has usually had little time, and in that time insufficient remaining energy, to attempt an appraisal of his work. The fact that his work has been reasonably well done is attested by the extent to which his products and his methods have met the demands placed upon them. On the other hand, no one can now say how much more might have been possible had the engineer done still more or done still better.

During the past two or three years he has sporadically, here and there, voiced the question suggested in the preceding paragraph. This might result from the fact that he has now found time for such unwonted practices, or, again, it might be due to the fact that others are forcing such a self-analysis upon him. As I have not observed any lessening of the hours of work of the engineer, nor any general diminution of the pile of current and past current material upon his desk, and as the day still consists of but 24 hours, I am inclined to lean toward the second explanation. Put baldly, this means that the engineering methods and practices of the past have now brought us to the place where other arms of the business are beginning to query, "How come?"

Too intense on the job in hand

I think that we engineers have concentrated too intensely and therefore too exclusively upon the work of the minute. That is, we have been so well occupied in finding a way of doing this and a way of doing that that we have not devoted sufficient consideration to the question of whether our solution should be considered *the* way. Too often, I fear, the discovery of a solution has been regarded as a satisfactory outcome; we have not gone far enough to determine the long-time value of our answer. And thus we find ourselves today facing unsolved problems of magnitude for which, in a sense, we have but ourselves to thank.

I would like to say here that I do not believe the engineer is the only member of our organizations who has sinned in this particular way. With due recognition of the effects of historical factors and with due respect for varying psychologies, varying modes of life, varying magnitudes and other variable complexions, it still seems to this particular engineer that many of those things regarded as the business of the non-engineering executive show excessively wide and unexplainable variations from place to place and from company to company. It also appears as though methods used or adopted are frequently changed rather often. When the commonly given excuses do not appear adequate it is usual to explain that this state of affairs flows naturally from the fact that ours is a young industry and that it must be recognized that we are still experimenting in such matters. If this be an adequate justification, I think we must agree that what is sauce for the goose is probably also sauce

for the gander, and that it may possibly justify to the same extent the engineering differences and the other differences.

Whether or not this is an adequate justification, it is still true that from the broader engineering viewpoint we engineers are guilty of having increased the cost of rendering an adequate service through lack of foresight, an unnecessary multiplication of varieties and sizes, and through failure in some cases to appreciate the possibly greater value of a good enough solution in comparison with a perfect one. And now we have arrived at the place where we must begin to take account of stock and to determine to what extent we can simplify the very complex structure that we have built and at the same time reduce the cost thereof.

Some of the difficulties which we have got into are now well known and commonly discussed. Probably the best example is the prohibitively rapid increase in rupturing capacity required in circuit breakers if a system is allowed to grow from small sze to large size without adequate provision for the limiting of fault currents. Many utility engineers have been overtaken by such a situation as a result of rapid growth combined with failure to anticipate the inevitable result. In most cases we have tried the use of larger and larger breakers, until finally forced to realize that such a solution is both costly and hazardous.

It is difficult to say in how far the engineer is open to criticism in connection with the development of such a situation.

It is my own opinion that his principal fault was in not making more noise about what he found himself being forced into rather than in following the old route until it became very obvious that he could not go much further in that direction.

It has been more or less taken for granted that the engineer could find ways and means of handling each new problem as it arose in the rapid development of this industry and, in truth, he has. That he has not always found immediately the best method proves only that he is, after all, a human being who learns most from experience and least from anticipation. Were the results of various financial and commercial policies, and others, as easily measurable as are the results of engineering decisions, it is highly probable that we should find that others have been equally guilty of failure or inability to anticipate the requirements of the future.

Weakness is variety

A real weakness of our engineering souls is, however, clearly shown by its products. Examine any manufacturer's list of almost anything specified by the engineers of our industry and attempt to justify in any rational way the tremendous variety there found. Can any thinking man convince himself that "local conditions" or any of the other overworked explanations really justify such a needless multiplication with its necessary accompaniments of increased complication, increased confusion and increased costs, direct and indirect? I think not. We have behaved like a lot of prima donnas, each intent upon his own particular little world and almost, if not entirely, disregardful of the fact that, after all, our little world is but a part of a very much bigger one, namely, our entire industry.

I sometimes wonder whether our costs and other results would be worse or better if we were much more limited in our choice of ways and means. Any one who has had much experience with filing systems knows the intense pressure to create new heads and subheads and also knows that such creation can be prevented only by insisting that the impossibility of using an existing division must be definitely proved before a new one may be created. It seems highly probable that we could accomplish the required results in our industry if forced to work under a similar rule and that the cost would be less than it now is. It is, of course, admitted that progress can be made only by departing from the norm and that some departures must, of necessity, prove abortive. What has been written is not to be understood as entirely opposed to such departures; it is opposed only to unnecessarily and unjustifiably numerous ones.

The dollar point of view

The crying need of our day is relatively lower investment. The engineer is appealed to to bring this about, because, after all, most of the investment is made on his designs and his specifications. And what do we engineers do? In many cases we sharpen our pencils and lubricate our slide rules and enter into most involved calculations to determine whether it will profit us to reduce the investment in power plant by one dollar per kilowatt of capacity if by so doing we increase the heat requirements by so many B.t.u. per kilowatt-hour. We think too frequently in terms of component parts when we should be thinking first in terms of complete assemblies. I do not want to be understood to mean that the cost of a complete assembly cannot be reduced by reducing the costs of its component parts; that is obviously not true. What I mean is that it behooves us to study, first, the several possible assemblies, determine that one which will give the cheapest results consistent with the character of service to be rendered and then, and then only, begin whittling on the number and cost of the components. A very small amount of work of this sort, which has been done in isolated instances, shows very clearly what results can be achieved.

Naturally, there is some limit beyond which one cannot or may not go in the reduction of investment. It will be time to talk about it when we have reached it. That we are as yet anywhere near it I refuse to believe. Granted that on cursory examination it now appears impossible to make much progress in this direction, this should not be taken as proof. One need not go back very far in our literature to discover that it was once assumed to be impossible to build a generating station to produce a kilowatt-hour on less than 18,000 B.t.u. without incurring overbalancing investment. And yet look at what has happened since and what is promised for the near future!

It is not so long ago that the expensive direct-current method of serving congested districts was the only recognized one. Now we have many engineers and executives willing to sponsor the use of a greatly cheaper method for such conditions.

It is still common practice to carry heavy boiler room steel far up into the air in order to hang heavy loads from the top of the building. Some few designers have found it much more economical to place more of this weight on or near the ground.

It is only a short time ago that six pounds of evaporation per square foot of boiler surface was considered

high in stationary practice. Now we think nothing of doubling and even quadrupling such outputs.

One might continue at length with such examples, but it appears unnecessary. It is very certain that we have not reached anywhere near the limit of reduction of investment in spite of the counteracting tendency resulting from higher standards of service and other factors. Now that greater weight is being placed generally on reduced investment, it is very certain that the necessary ways and means will be discovered.

The commercial point of view

It is axiomatic that better utilization of facilities brings about the same effect as reduction of investment in such facilities. Also, it has recently been rather widely shown that the great promise in this direction lies at present in the development of residential load; that is, more kilowatt-hours per residential customer year. We are apt to regard this as the business of the sales department, but is it entirely so? After all is said, the increased residential use must come largely from the greater use of a greater number of appliances, and these must be produced by engineers. I wonder how many of the engineers of our industry who are not connected with manufacturers of such appliances have ever given them serious thought or study. Probably not many. And yet, here is an engineering field that is just ready for cultivation and all the indications point to bumper crops.

A very casual inspection shows the most astounding facts. The investment required of the residential customer to put him in position to utilize to the extent that we now believe possible is of very large magnitude. And, in many cases, there is no certainty that after he has made the necessary investment he will find that he has purchased satisfactory equipment. The engineer, therefore, has here two problems—one the reduction of first cost; the other the improvement of quality with respect to much of the material now available. And there is plenty of opportunity for fruitful work along both lines. Neither of these problems is unsolvable. We are dealing with things which can be produced by repetitive manufacturing processes.

Did we but use one-half the thought and ingenuity that have been devoted to the improvement of quality and coincident reduction of cost of the automobile, the use of a few thousand kilowatt-hours per residence customer year would be a much more expectable phenomenon and a much more pleasant and profitable experience for the said residence customer.

This article has thus far had certain rambling characteristics because I have tried to spread over a very wide field and must necessarily spread so thinly as to strike only here and there. However, it may serve to focus attention upon that which the engineer of this industry must develop himself into if he is to do successfully the job that now confronts him. He must apply more of the executive's practical and common-sense viewpoint to the solution of problems in a long-visioned way. He must realize that thus far he has confined himself all too narrowly both in thought and in activities. He must still utilize his peculiar type of training and his peculiar insight into the possibilties and limitations of nature, but he must do this with these things only as incidental facilities used in the solution of problems of a broad nature in a broad way. They must not serve, as they have too often in the past, to limit his vision and to confine him to calculations regarding minutiæ while the world sweeps on in a majestic march of which he is only partly cognizant. Can he do it? Yes. Will he do it? He must.

A little crystal gazing

Some of the engineering problems facing us have been touched upon incidentally above. There are many others, and some of these are going to become more pressing as time goes on. It may be profitable to mention a few.

It has been comparatively easy thus far to reduce production costs at a rapid rate. More is in sight in this direction. We are promised plants that will produce a kilowatt-hour with about 9,000 B.t.u., instead of, say, 12,000 as the present best. We are assured that the investment required will not be excessive. While a reduction of the magnitude indicated represents a decrease of 25 per cent of the fuel cost, it does not represent much in the total money cost of the unit delivered to the customer. We are approaching now a condition in which great improvement of thermal efficiency, even with the same investment as before, is of ever-lessening economic significance.

Such a situation generally means that there is just around the corner an epoch-marking invention of some sort. But we can hardly afford to stand still and wait for it. We must therefore do what we can further to increase thermal efficiency, but at the same time decrease costs.

It also appears that the time has arrived when it becomes necessary to consider ourselves more as part of a heat-using community instead of only or almost entirely as a source of electricity supply and service. I refer to the possibility of many combinations for utilizing waste heat, waste steam or waste electricity producing capacity.

Much of our activity during the past few years has centered about the more or less perfect integration of small units into larger ones. With respect to the physical integration, we still lack lightning- and wind-proof lines, or any substitute therefor which is widely usable. We still lack the relays required for very quick segregation of defective parts as necessary for maximum stability and we could use advantageously circuit breakers which would interrupt the circuit much more surely and much more quickly after the relay has acted. We still need to know a lot more about lightning and its effects upon different sorts of assemblages.

There is another aspect of this integration which appears equally important. The brain that can conceive and execute the involved financial transactions incident to the building up of huge systems tends automatically to think in terms of territory, operating ratios, rate of growth, return on investment, etc., rather than in the concrete, physical terms of the individual who is close to the job, knows his physical property intimately and has his finger on the pulse of his public.

Admitting that combination into larger units, when properly done, represents a necessary and desirable economic development which is in the interest of the public served, it must nevertheless be obvious that it carries with it many opportunities for trouble of various sorts.

On the engineering side, it has the advantage of leading toward a standardization of practice and purchase,

but, by the same token, there is the danger that we may lean too far in this direction and not give sufficient thought to local conditions requiring special or more nearly special treatment. It appears necessary to preserve a very careful balance between the specializing tendencies of the local engineer and the standardizing or leveling tendencies of the remotely located or headquarters engineer.

On the engineering side, also, it has long been recognized that lack of intimate contact with the daily operating grind tends toward the development of paper engineering. That is, there is a gradual tendency toward idealization of design, on the assumption that those things will work satisfactorily which appear as though they should, rather than the preservation of the operator's hard-boiled practical view, that those things work that do work.

Experience indicates that these larger units can be so organized that engineering, like other functions, can be cared for as well as they are in the smaller units, while at the same time obtaining the advantages that are inherent in the larger size. Moreover, large size permits of a co-ordinated treatment of engineering development and research in a way not possible with small disconnected properties. It is hoped that these potentialities may be used in the future more than they have been in the past. Now, more than ever, is our industry in need of that sort of thing. We have now learned enough to know how little we know and to appreciate how restricted our progress will be until we have acquired much more extended knowledge. The scientist and the engineer must continue to forge ahead even more rapidly than they have in the past and over a much wider expanse of territory. The direct results of their efforts will be rapid obsolescence of equipment and methods, but that has proved profitable to all in the past and may be expected to do so in the future.

It is in a sense a curious way to put it, but *creating obsolescence is probably the greatest work of the engineer.* The rate at which he does so determines to a great extent the rate of our material progress, and I believe also the rate of our cultural progress.

Public Benefits From Co-operative Power Development Under Private Ownership

By GUY W. TALBOT

President Pacific Power & Light Company

IN THE Pacific Northwest is to be found an excellent example of the present trend in power development. Here interconnection has made it possible to treat several of the larger systems as one, so that the most over-all economical development of new hydro and steam capacity will result. This has greatly simplified the problem. With the completion of a 110-kv. tie between the Northwestern Electric and Pacific Power & Light systems during the summer of this year six of the systems will have interconnections of sufficient capacity to permit several systems to participate in absorbing power from a major development on any one system.

Such a co-operative plan has been followed by the two Portland companies for several years with mutual advantage, and at present there is under construction a 45,000-kw. hydro-electric development by the Inland Power & Light Company with an ultimate capacity of 180,000 kw., from which power will find its way into at least three of the large systems. It is only under such a plan that some of the larger water-power sites on the Columbia and Deschutes can be undertaken.

Thus, in this section of the country private industry is developing hydro-electric resources in economical order and making the power available to the territory as a whole, a thing impossible under municipal or even state ownership because of the interstate nature of the problem. Communities of the Northwest as a whole are deriving the benefits.

Conditions that Retard Adequate Service Facilities

By A. M. PERRY

Managing Editor ELECTRICAL WORLD

AMAZING as the growth of the electrical industry has been, many men in it have contended that its expansion has been limited to only a small portion of what it might have been by inadequate wiring in homes, commercial and domestic building and industrial plants. Some attempts* to remove this bottleneck to maximum growth have been partly successful, but there has not been the widespread improvement which every one desires.

Why does this objectionable situation persist? Isn't it possible that each group concerned has been so interested in its own specific problems that it fails to visualize the wiring problem as a whole? If so, it is quite natural that there should be disagreement in approaching the solution and unco-ordinated approach will be relatively ineffective. Apparently individuals, departments or companies which do not have a primary interest in more adequate wiring have failed to recognize that their business is indirectly, but nevertheless definitely, curtailed by inadequate facilities for greater use of electricity. But what is most important of all, have the persons who are expected to spend the money for adequate wiring been given convincing evidence that they will be the losers eventually if they do not provide facilities initially?

Buyer's viewpoint paramount

If it were not so often overlooked, it would be unnecessary to emphasize that the purchaser's viewpoint must always guide any successful effort to interest him in purchasing facilities which he does not possess. Too often the purchaser is approached with something to sell, instead of with a desire to ascertain his problems with existing conditions and the suggestion of how that problem can be solved. He is usually willing to discuss his difficulties and is sympathetic to suggestion for solving them if they are not subordinated to the buying of equipment. When the prospective buyer will not discuss his difficulties there is always the opportunity to illustrate specific problems that others have had.

Consider the home, for example. Certainly electrical men who are eager to improve home wiring have had personal experiences enough with inadequate wiring to recite with forceful illustrations the inconveniences and expense that arise when attempts are made to connect or shift the position of portable lamps, radios, electric fans, sun lamps, irons, percolators, toasters, vacuum cleaners, etc., or when they try to modernize old lighting equipment, install an electric range, refrigerator or water heater if inadequate wiring or insufficient outlets have been initially installed. Recalling these inconveniences makes the prospective customer more receptive to the idea of modernized wiring, and if he has adequate wiring and outlets he will be a more prompt purchaser of equipment that may be attached thereto.

If the occupant is a renter instead of an owner, his desire for these facilities must be so intensified that owners and builders of even speculative structures can be convinced of the value of electrical facilities.

Adequacy in new homes a selling feature

While the rewiring of old homes and apartments offers an extensive field for modernization, repetition and dramatization of the inconveniences of inadequately wired homes should be helpful in directing more attention to the value of adequate electrical facilities in new homes. Creation of a public demand is particularly necessary if speculative builders are to be aligned with any program for more adequate wiring. Even some architects have to be influenced by their clients' demands before they will give more than casual attention to electric service facilities. If the addition of new accessories to automobiles has helped in their sale, certainly the provision of adequate facilities for using electricity could be used as an inducement in the sale or renting of homes and apartments. The advantages have not been sufficiently dramatized or 57 per cent of the new and rewired old homes would not be inadequately equipped.†

The Code is frequently brought up as an inhibition to adequate wiring or modernization, but many of the objections to it would be largely removed if a widespread attempt were made to bring before builders and contractors the latitude allowed by the Code. Since the relative costs of different types of wiring are frequently brought into question, there seems to be a need for disseminating more data on this subject, as it appears that few men in the electrical industry have the information based on bidding estimates, which the Association of Electragists and Society for Electrical Development have claimed are available.

**Red Seal homes and suggestions to architects for wiring commercial buildings.*

†*See* ELECTRICAL WORLD, *March 23, 1930, page 587.*

The relationship of the home owner or builder with the contractor must also be given serious consideration in any adequate wiring program if the customers' imaginary or real problems which discourage adequate wiring are to be removed. For example, the individual home builders, and sometimes the resale builders, raise the questions: "How can I locate reliable contractors? Why can't I get definite estimates of cost before proceeding? How can I be sure I will get the results I expect?"

But this customer-contractor relationship is common to commercial and office building and industrial plant wiring as well, so it will be discussed later.

More complex conditions account for the inadequacy of wiring in commercial and office buldings. Many buildings are put up for speculative purposes and the builder has little interest in their equipment so long as he can sell them for a profit. If an architect is engaged he is usually compelled to limit expenditures to just the features which prospective buyers will demand, and usually they are interested only in obtaining sufficient rental to induce purchase by another buyer.

Stimulate public demand for adequacy

Hence public demand for better facilities seems about the only way to influence speculative builders, as anything beyond safety requirements is beyond the province of codes. Some thought has been given to labeling commercial buildings which meet adequacy requirements with a Red Seal so the prospective tenants will be aware of the fact. But even such labels will be ineffective unless the prospective tenants are made to realize the value to them of adequate electric service facilities.

When a building is erected for occupancy of the builder or as an investment, greater interest is shown in providing adequate facilities initially and high-class architects are more likely to be engaged who are not limited so severely in expenditures as they are in speculative buildings. Consequently the contractor may have a better opportunity to do a job of which he may be proud. But even in such cases there have been astounding examples* of failure to recognize the needs of the near future, with the result that facilities could be provided later only at exorbitant expense or not at all.

One leading architect makes the following comments regarding electrical equipment for such buildings:

> As a rule the client is able to outline the general requirements, such as the proposed use or occupancy, the class or quality of tenancy expected or desired, the space requirements for any determined occupancy and his ambitions as to the representative quality of the structure. Usually he has in mind a prototype or example which he uses for visualizing the project. Rarely does this furnish sufficient ground for an estimate of cost. More frequently it needs preliminary sketches to establish a basis for equally preliminary estimates. Discussion then develops the quality of building warranted by the controlling conditions, which in turn automatically proportion within a certain range the amount to be spent on each part to secure a balanced whole of the stated quality. Naturally any particular trade can be favored or starved according to the expressed desire of a client.
>
> Clients, as a rule, expect adequate lighting and look to the architect to lay out his work with that in view. The provision as to feeder sizes is determined directly by the amount of lighting to be provided for, and the number of switches is part and parcel of the distribution system the proposed uses of the structure dictate.
>
> The percentage of electrical cost to the total in a high-grade office building built in 1927 was 6 per cent, compared to a percentage of 3.4 per cent in an equally high-grade building built in 1920 and a percentage of 4.4 per cent for a similar type of building built in 1910. Owners are usually willing to provide for expected tenant demand.
>
> It is quite customary for architects to call in consulting engineers on the electrical work rather than lay out the work themselves, and it is a *sine qua non* of such employment that the engineer be given as much freedom as possible. In well-conducted offices the electric design is co-ordinated with the development of the architect's plans.
>
> The electrical engineers' responsibility should embrace supervision of installation, but this does not exclude architectural supervision, needed more particularly for positioning and appearance of the completed work so far as it is exposed to view.
>
> Both quality and price are usually considered in specifying, as each factor relates in turn to the type, quality and proposed use of structure for which the work is intended.
>
> With work properly co-ordinated, conflict between electrical and structural requirements is reduced to the economical arrangement of the purely physical quantities. It is obvious that in a given case a very economical type of building construction will cost more if adequate provision is made for electrical work. This is not a fault of the electrical work, but is merely a qualification of the construction used, which is discounted by its desirability.
>
> The electric consultant is a free agent in suggesting facilities, and it is one of his duties to study and advise what are the appropriate facilities for the various types and qualities of buildings.

Based not only on this comment but the statements of some leading consulting electrical engineers, they are chiefly responsible for convincing the architect of the need for different electrical facilities. However, if the engineer does not recognize the necessity of presenting convincing evidence to the architect that certain questioned facilities will be an economic asset to the builder, such facilities will most likely be omitted, even though the consultant was justified in recommending them. If the consultant does not convince the architect of their value, certainly the architect cannot convince the builder that the additional expense is justified.

Architects, being esthetically inclined, sometimes find it difficult to comprehend the economic value of technical requirements which consulting engineers present. And engineers, being scientific, sometimes overlook the fact that they cannot justify their requirements unless they present them in terms of the builders' or architects' problems. Furthermore, occasional consulting engineers maintain that they are only engaged to meet the requirements of the architect or builder and have no license to recommend or urge facilities not requested. In making this comment, however, it seems that engineers are failing to fulfill an obligation they owe their client.

Consulting engineer has major responsibility

Probably the greatest cause of inadequate electric service facilities in commercial and office buildings is that too many have never been planned by consulting electrical engineers. Many buildings, particularly those erected by speculators, are farmed out to the lowest bidding contractors, who have no incentive to provide any facilities which are not specified, since they secure the business on price alone. Where the building is planned by the builders' own organization it frequently happens that it does not have the advice of an electrical engineer, so the electric-service facilities are neglected, unless the local public utility company has had an opportunity to suggest necessary facilities.

Therefore, to improve service facilities in commercial and office buildings, builders must be convinced, by reciting costly mistakes of the past, that money is saved in the long run by employing consulting electric engineers.

*See ELECTRICAL WORLD, *April 12, 1930, page 748.*

Recent engineer-architect conferences* have been very helpful in establishing a more intimate understanding of each others' tasks and more of these conferences should be held throughout the country until personal contacts of a similarly helpful nature develop.

If speculative builders cannot be convinced in any other way of the aid of adequate electric service facilities in disposing of their buildings, public demand therefor can be created by widespread publicity regarding the inconveniences which tenants experience in adequately wired buildings or by illustrating the conveniences of adequate service facilities.

Failure to use consultants handicaps industrials

Inadequate wiring in industrial plants is due to similar but different combinations of conditions. While some plants employ electrical engineers, many more have only high-class electricians, who use excellent judgment in handling equipment installation, maintenance, testing and repair, but are seldom called into consultation when an entirely new plant is built. Then, too, many electricians seem to be "expedientists," handling situations as they arise, instead of analyzing problems and suggesting a solution before it is requested by the master mechanic or works manager. In many ways it appears that electricians, experience should well qualify them to outline electric service requirements, but it is recognized that a balance sheet of costs and benefits must be prepared to judge advisability, and this is just one of the services which an electrical engineer or consulting engineer can render. Some of these industrial plants which do not have electrical engineers engage consultants, but more frequently depend on manufacturers, utilities and contractors to do their engineering for them.

In plants which employ high-class electrical engineers it may be expected that more attention will be given to planning for the future. But even these men frequently have difficulty convincing their superiors of the economy of providing for the future and emergencies. Or they may forget, when building a new plant or extending an old one, how much layout of electric service facilities has affected continuity of operation, use of investment in plant, utilization of labor, cost of changing services and extending plants.

The tendency of some industrial managements to look on spare equipment, spare circuits, providing space for future circuits, etc., as a useless expenditure of money can only be overcome by repeatedly emphasizing and illustrating the labor-consuming, service-delaying operations which occur daily, weekly or monthly because provision was not made for readily handling these contingencies in the first place.

While it is evident from the brief résumé of conditions affecting adequacy of electric service conditions that every one involved in the planning, execution and practice of the buildings must be convinced by more widespread dissemination of facts regarding the serious disadvantages of inadequate facilities and the tangible advantages of better facilities, the situation of the contractor must be corrected before much progress can be made.

The blame placed on contractors is largely due to conditions not within their control, and under which even the critics would probably commit the same offense. Contractors usually secure business only by competitive bidding. If they had definite specifications on which to bid, this would not be such a handicap, but many specifications are so loosely or impractically drawn that the unscrupulous contractor can always underbid the conscientious contractor by skimping here and there where requirements are not definitely specified. With such loose specifications each contractor is compelled to do work for which he is not paid and which should be done before he is asked to bid, namely, analyze requirements and lay out the systems as well as the details of the equipment and work.

Since no contractor doing this free engineering work has assurance of getting the contract, even if his bid is lowest, and is compensated only for materials and labor, and sometimes only labor, such engineering work should not be required of contractors, but should be done by electrical engineers or consultants so the contractor will only have to bid on the cost of doing the work.

Another practice which makes a contractor's work uncertain is that when bids are all received some clients reveal the lowest bid to a friend with the suggestion that he underbid it. After securing the bids, clients frequently turn over the whole construction job to a general contractor, who may then ask for new bids below the originals and pocket the difference. As a result the new successful bidder has to skimp and the original successful bidder, as well as the owner, loses. In some cases pressure is brought on the contractor by manufacturer or jobber friends of the owner.

One factor which makes it uncertain whether a contractor will get a contract for both material and labor is that some jobbers solicit the industrial field extensively and cut the contractor's price to get the business. On lighting particularly is this true; some manufacturers' representatives even go direct to the industrial plant, not because they believe in it, but because they are forced to it by competition.

To combat this practice, contractors in one city refuse to do any work for clients whose purchasing agents try to get reduced prices (from a jobber or manufacturer) which are not justified by the size of the order. In another city the contractors have induced the jobbers to restrict their solicitation of business to large customers. The justification of these retaliatory methods is open to question, but they indicate forcibly some conditions that need correcting.

It isn't wire, sockets and lamps that a contractor's clients buy, but complete service, which involves something more than material and labor.

Indefinite specifications cause wiring abuses

To get better wiring jobs the following suggestions are made:

(1) Select competent contractors—men who have experience, equipment and financial backing; (2) don't expect them to devote time to design for which they are not paid, or ask them to do estimating and then give the job to some one who has spent no time on the preliminary work; (3) have the design and specifications prepared by a reputable engineer who has no interest in getting the wiring business or commissions on equipment used; (4) ask for bids only from the selected competent contractors and do not "tip off" some one to underbid them or furnish the materials, allowing the contractor only to furnish the labor.

*See ELECTRICAL WORLD, *April 26, 1930, page 748.*

There is the possibility of getting several reliable contractors in each community to give a flat rate per outlet connected on the basis that all work in the community is turned over to them. This was done in Chicago, the utility company receiving the orders and passing them over to the contractors' organization for assignment. The organization, in turn, transmitted the bills to the utility company, which paid them, and charged the amount on the customer's bill.

One other scheme that has elements of merit, if not entirely perfect, is being applied in St. Louis and being considered in Chicago. It is an electrical approval bureau. It is intended to remove some of the foregoing objectives of contractors and guarantee the client that his specifications will be fulfilled. The first duty of the St. Louis bureau is to help the engineer, architect, owner, or whoever plans the job, make a complete, fully detailed, adequate plan and specifications. The plan and specifications are then certified by the bureau.

Through the co-operation of the labor organization, the bureau guarantees that the work will be enacted as specified. The filing of specifications assures every contractor bidding on the job that he is bidding on the same conditions as his competitors.

▼ ▼ ▼

Decade's Growth—

139 per Cent

Operating costs increased by a much smaller proportion than gross revenue. Ratios and trends mostly favorable. Some dilution

CONTINUOUS effort has been exerted by individual power and light companies to stabilize operating costs. For the industry as a whole, costs have increased 128 per cent in the decade since 1920 and gross revenues have increased by a considerably larger proportion, 139 per cent. Energy generated increased 130 per cent and number of customers 150 per cent.

A survey of the decade's progress shows rapid growth in energy output and in revenue. The less rapid percentage increase in operating costs than in new capital investment is significant. Capitalization, however, continues to increase at a more rapid rate than revenue.

Although gross revenue per dollar of capitalization declined sharply after 1926, net revenue per dollar of capitalization remains approximately level. Over the past two years there has been a steady upward trend in net revenue per dollar of capitalization.

Turning to the volume of business done, most indicators are favorable. The increase in customers has been rapid. Domestic light customers show the larger increase, while commercial light customers and power customers have increased at a less rapid rate. For all customers a study of the revenue realized per individual customer shows a sharp rise during the past year, after a steady rise for three years. Revenue per lighting customer has increased less rapidly than that per power customer. From 1925 to 1928 the line representing revenue per lighting customer showed a steady falling off, but rose sharply in 1929.

When the same situation is studied from a standpoint of the power output per customer this ratio is seen to have been practically at a level during the past two years after a sharp rise. There is a substantial rise in kilowatt-hours sold per power customer and a falling off in the case of kilowatt-hours sold per lighting customer. It is probable that an explanation of the decline in this latter ratio is the presence of a number of retail stores and other large intermediary buildings in the figure some years back. Recently the figures showing the purely residential lighting customer have been computed on a more accurate basis. It is expected that this class of business will make the greatest gain in future.

Where the revenue dollar goes

A study of the attempt of management to secure a larger surplus and yield out of revenue discloses some interesting trends. A group of steam plants have reduced their average of operating costs from 62 to 47 per cent of gross revenue. In the case of a group of hydro plants the reduction was less marked—from 43 to 39 per cent. The interest proportion is larger, of course, in the hydro plants and remains almost constant. Surplus shows a tendency to narrow down in the steam plants and to expand in the case of the hydro plants. This is due, presumably, to factors affecting the companies studied rather than to their classification from a standpoint of source of energy.

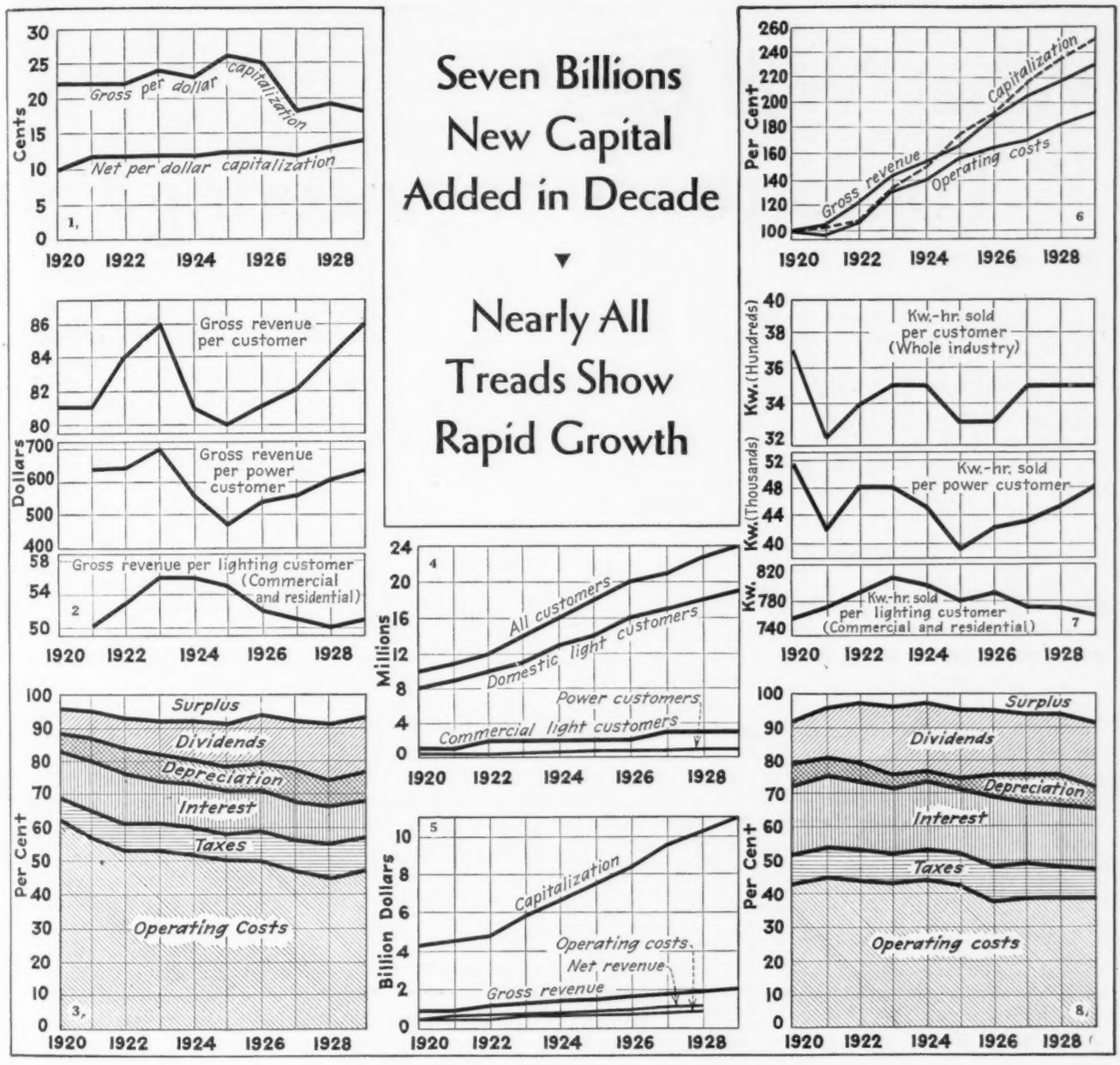


Fig. 1—Revenue per dollar of capital

Net revenue per dollar of capitalization is growing more rapidly than gross per dollar of capitalization, showing stabilization of costs.

Fig. 2—Revenue per customer

Revenue per power customer was $631 in 1929 and revenue per lighting customer $52. Both are increasing rapidly.

Fig. 3—Division of revenue, steam plant

Operating costs have been reduced steadily and dividends show expansion.

Fig. 4—Power and light customers

Domestic lighting customers show much more rapid growth than commercial lighting and power customers.

Fig. 5—Revenue, capital and costs, totals

Actual figures for revenue are increasing much less rapidly than capitalization figures.

Fig. 6—Revenue, capital and costs, ratio

Gross revenue is increasing on a more rapid ratio than operating costs, but less rapidly than capitalization.

Fig. 7—Output per customer

Kilowatt-hour output per customer is increasing slightly, but output per lighting customer shows a falling off. Output per power customer for entire industry is rising sharply.

Fig. 8—Division of revenue, hydro plants

Costs of operation largely stabilized. Surplus shows increase.

What Will Be Tomorrow's Engineering?

Never static, the electric light and power industry is always at the crossroads. Which way now? What's ahead? Convention time is a good occasion upon which to peer thoughtfully at the mist-veiled future. Sixteen engineers, foremost leaders in their respective fields, have formulated their anticipatory thinking for our readers

Steam Stations

Metallurgy important—Alfred Iddles

Construction Manager United Engineers & Contractors, Inc.

IN HIS search for increased efficiency and decreased investment, the power engineer in the future will probably be most interested in the development of the mercury cycle and the achievements of the metallurgical engineer.

The metallurgist should be a close friend of the power engineer and together they probably will be able to use much higher steam temperatures. This should make it possible to build a simple, moderately high-pressure no-reheat station and improve on the present combination of efficiency and fixed charges.

250,000-kva., single-unit generators possible—F. D. Newbury

Manager Power Engineering Department, Westinghouse Electric & Manufacturing Company.

A SIGNIFICANT trend in large turbo-generators is toward larger and larger size. Few new propositions from the utilities call for main generating units of less than 100,000 kw.

Single-unit, air-cooled, 1,800-r.p.m. generators can be built for ratings up to 200,000 kva. With hydrogen as the cooling medium, single generators up to 250,000 kva. can be supplied without increasing the essential dimensions of the 200,000-kva., air-cooled generator.

The large capacity turbo-generator can be built for direct generation at 22,000 to 25,000 volts, and the windings can be arranged in two circuits for independent operation.

Higher temperatures due—Geo. A. Orrok

Consulting Engineer.

ATTRACTIVE reductions in fixed and operating charges may be expected with the increase of temperatures to, say, 1,000 deg. F. and the elimination of reheating which will be made possible with the steam pressure range from 500 to 750 lb. Persistent efforts being made both here and abroad to develop drumless steam generators of the coil type should bring the cost of the steam generator somewhat lower, making high pressures economically available for smaller industrial plants. One of the most important questions with high-pressure steam operations is the treatment of feed water and the progress made in the last three years has been highly satisfactory.

Ultimate in boilers not reached—D. S. Jacobus

Advisory Engineer Babcock & Wilcox Company

DURING the last 25 years steam pressures in central power plants have raised from 225 lb. per square inch as a maximum to over 1,400 lb. and superheated steam temperatures from about 500 deg. F. to 800 deg. F. and over. The capacities at which boilers are operated has increased from about 50,000 lb. of steam per hour to 500,000 lb., or, where two boilers are placed over the same setting, to the neighborhood of 1,000,000 lb. The over-all efficiency of the boiler and its appurtenances has increased from about 75 per cent to 85 per cent and over.

Boiler manufacturers are prepared to build boilers for still higher pressures and steam temperatures whenever there is an economic need.

Pulverized fuel leads—P. W. Thompson

Chief Assistant Engineer of Power Plants Detroit Edison Company.

THE very high steaming capacities now being obtained from some recently installed steam-generating units would have been merely a conjecture had it not been for the advent of the pulverized fuel method of firing. It is true that recently stokers have been designed and built which successfully burn greater quantities of coal than was customary a few years ago, but no stoker has yet been constructed which will burn the quantity of coal required to produce the steam output demanded from some of the recent boiler installations.

Future development of an art which in its present

method of adaptation is only about ten years old should eventually overcome the present unsatisfactory features of pulverized fuel firing and, by so doing, encourage the development of "bigger and better stokers."

Hydro-Electric Plants

Standby use gains favor—W. M. White

Chief Engineer Hydraulic Department, Allis-Chalmers Manufacturing Company.

THE hydraulic turbine is becoming an important factor as a stand-by unit due to the fact that it can be put on the line immediately in case of an interruption of the service due to failure of the steam-driven unit. In some cases this stand-by service becomes equal in value to that of the energy developed. Water-power developments, therefore, that have sufficient pondage available are now being developed for much larger units than would have been considered economical in former practice. Hydraulic turbines are now being built with this stand-by service in view and every effort is being made to reduce the water requirements for keeping the unit at no-load synchronous speed, ready for coming into service under full load within the time limits of the governor operation.

The new feature in hydraulic turbine design is the extensive use of the adjustable blade propeller runner both of the manual adjustable blade type and the governor adjustable mechanism. Each has its field and in some cases a combination of the two will show decided advantage from an operating standpoint. The adjustable blade runner permits a flat efficiency curve of the same general characteristics as an impulse wheel except that its maximum point of efficiency is from 5 to 6 per cent higher.

Transmission

System insulation will be rationalized—P. Sporn

Chief Engineer American Gas & Electric Company.

LIGHTNING voltage surges which for many years served as a very good explanation for service outages have now lost their effectiveness in this regard. This trend is to continue; the pressing demand for more and more perfect service is bound to go on and will keep up until this ideal is very closely approximated.

Many operators have met this problem by raising the insulation level of their lines. Fortunately there is a very definite awakening to the need of rationalizing the entire problem of transmission system insulation among a large number of organizations, and this is one of the most hopeful signs and promises of its ultimate satisfactory solution.

There have appeared, it is true, tendencies, particularly among manufacturers, to codify some of the changes in practices in this regard, but fortunately this tendency has been averted so that the entire problem is free to continue and develop itself along natural lines. The entire question of lightning protection is fortunately very active at the present time and a large number of active and keen brains are at work on it, and while the problem is not solved, the hope for its ultimate complete solution is brighter than ever.

Lightning no longer an unknown—F. W. Peek, Jr.

Consulting Engineer General Electric Company.

THAT lightning phenomena are now expressed quantitatively is evidence that the subject is on an engineering basis. It is now possible, for example, to predetermine the lightning voltages for a given transmission line and to design apparatus and insulation to resist them; the effect of the ground wire even for direct strokes can be determined; the characteristics of certain lightning arresters can be expressed with precision; a notable achievement is the lightning-proof and non-resonating transformer; line co-ordination is an advance. This has been brought about by knowledge gained by mathematical and laboratory research and by field work in which operating companies have had a large part.

"High-speed" relays inevitable—H. P. Sleeper

Relay Engineer Public Service Electric & Gas Company.

RELAY protection of high-voltage systems is in a transition stage. The ills of time-element relaying are being eliminated by the introduction of so-called "high-speed" relays, which operate in a few cycles. System stability considerations have forced this issue, but its evolution was inevitable and should be most beneficial to the consumer. There is also a trend in the art toward the development and use of protective relays and schemes that are inherently selective. Thus we find increasing usage of balanced line schemes, pilot wire and carrier-current schemes and distance relays.

"Distributed protection" a probable trend—A. L. Atherton

Miscellaneous Engineering Department Westinghouse Electric & Manufacturing Company.

OUR viewpoint on lightning protection has changed radically with the introduction of the glow discharge type of arrester, the characteristics of which can be definitely predicted, and with the acquisition of knowledge to replace conjecture in regard to both lightning itself and the way insulation and protectors behave.

The way seems to be open to continued progress toward the goal of practically complete freedom from lightning damage and outage and at a reasonable cost. The good results secured thus far by the growing use of "distributed protection" give indication that even though this alone is unlikely to yield a complete solution, the advantages may outweigh the faults and that the protection method of the future may be the use of small units distributed along the circuit.

Oil breakers probable future favorites—J. Slepian

Consulting Engineer Westinghouse Electric & Manufacturing Company.

IT IS quite evident that revolutionary changes are under way in the art of power circuit interruption. Whereas only a few years ago the problem seemed to be to find any avenue at all which might lead to improvement in circuit interrupters, today we are almost embarrassed by the profusion of attractive possibilities which are being pushed assiduously in America and Europe.

With the art in such a state of flux, prophecy is dangerous and of no great value. However, it appears to me that improvements in oil breakers have been so far

reaching, the hazards so greatly reduced and the reliability so greatly increased that the oil breaker will continue to be preferred over other types in the higher voltage classes for some time to come. In the lower voltage classes I expect to see breakers of the Deion, gas blast and similar types gradually displacing the oil breaker.

Distribution

Urban distribution leads to networks—M. T. Crawford

Superintendent of Distribution
Puget Sound Power & Light Company.

THERE is a definite trend toward standardization of the general features of network system design, such as three-phase, four-wire secondary mains for combined light and power, with as high a lamp voltage as small appliances will stand. The trend in primary feed is toward interleaved radial feeders at generator voltage or at the secondary transmission voltage, in order to realize the economy which results from the elimination of distributing substations.

Network protectors have been perfected to a high degree of operating reliability and subway transformers are provided for high primary voltages with built-in terminal and switching facilities. More than 30 large cities have network systems in operation.

More networks in buildings—D. K. Blake

Central Station Engineering Department,
General Electric Company.

VERTICAL a.c. networks recently applied to very tall buildings manifest (1) the adequacy of this system for anticipated load densities of the future and (2) its superiority for giving uniform voltage conditions within the building. However, tentative economic analysis of a very large industrial building having a load density of almost 1,000,000 kva. per square mile indicated the advantage of the network, but also revealed the necessity for 440 volts or higher. Some industrial establishments will probably adopt the network method in the future. Further simplification will result by using combined transformer and network protector units.

240-kv. cable to eliminate substations—G. B. McCabe

Engineer on Cable Practice Detroit Edison Company.

REPORTS of the underground systems committee, N.E.L.A., indicate that high-voltage cables (6,600 to 132,000 volts) have improved markedly in recent years, as evidenced by inspection, testing and operating results. An important development is the proved practicability of 132-kv. oil-filled cables, those in New York and Chicago having operated over 2½ years without failure.

The recent placing in commission of 150 miles of 240,000-volt cable in Italy and the announcement of American manufacturers of their readiness to manufacture cable of the same voltage indicate that the cable type of system is keeping pace with the overhead one. Obviously, this will permit the direct connection of cable lines to overhead lines of all voltages, thus eliminating the necessity and expense of transformer substations.

System Operation

Co-ordinated engineering will aid—J. M. Oliver

Operating Manager Georgia Power Company.

THE major benefits of interconnection of adjacent power systems, namely, increased economies, more reliable service, better load and rainfall diversity, and reduction in reserve generating capacity, are being realized to a very large extent on many systems. In a number of cases information pertinent to successful intersystem operation is being regularly exchanged through the medium of committees composed of representatives of the companies involved. Operating schedules are formulated mutually and operation along uneconomic lines is being avoided wherever possible.

In the Southeast load distribution between parallel interconnecting lines is being controlled by segregating generating stations and synchronizing them at load centers. Voltage control is secured by synchronous condensers and floating unloaded or partially loaded hydrogenerators. In one case a voltage regulating transformer bank is employed. The use of Master time clocks and automatic frequency control has materially improved intersystem operation.

The continual improvements which are being made in system layout, apparatus, transmission lines, communication facilities and in the art of lightning protection should result in still more efficient and economical operation in the future.

Automatic Stations

Multiplicity of devices being reduced—C. Lichtenberg

General Electric Company.

THE trend is toward the application of automatic control to larger units. Equipments are now being installed to control 22,000-kva. hydro-electric generators and 20,000-kva. Scherbius frequency-changer units.

Tendencies in design have been toward the increased use of conventional devices familiar to the usual operating personnel, thus leading to making the usual switching and control devices more reliable. There is also a marked trend toward the combining of two or more functions into one device wherever practicable. This reduces the number of devices required for protective features.

The mercury-arc rectifier development has permitted a return to an early automatic station recommendation; to the effect that single-unit stations be placed at strategic points in the distribution system.

Supervisory system improvements have been in the almost exclusive standardization of the visual indication principle. New designs are now available utilizing two wires between a dispatching office and one outlying station for a limited number of operating and indicating positions. Another design utilizes four wires for operating from two to ten outlying stations from a single dispatcher's office.

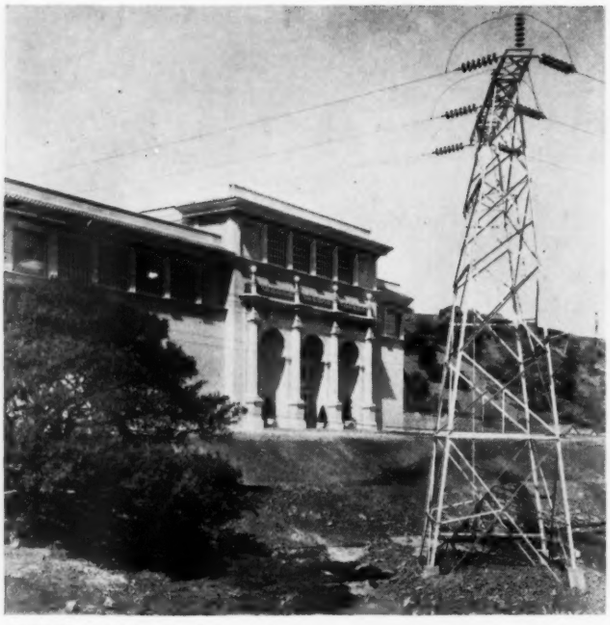
Telemetering equipment has gradually been improved until now it is considered just as reliable as the connecting wires and as accurate as usual switchboard indicating instruments. Many of the telemetering designs are independent of circuit resistance, reactance and capacity.

N.E.L.A. PICTORIAL INSERT

THE WONDERLAND OF AMERICA

THE SAN FRANCISCO FERRY BUILDING SHINES AS A WELCOMING BEACON FOR THE ARRIVING VISITORS TO THE NATIONAL ELECTRIC LIGHT ASSOCIATION CONVENTION, JUNE 16-20

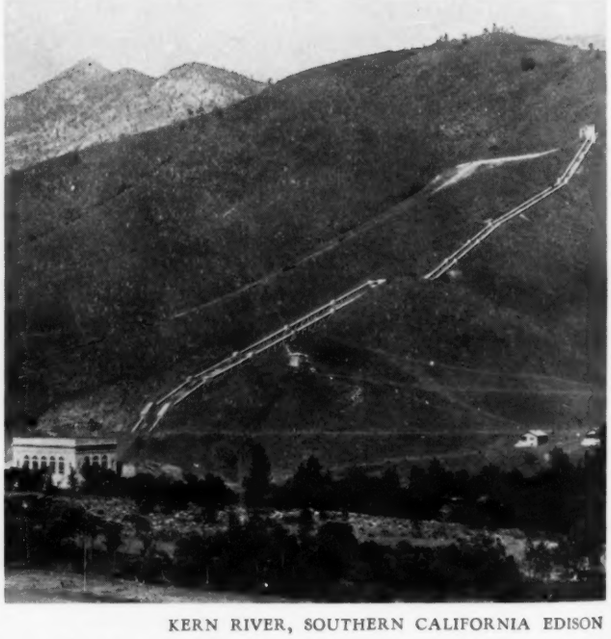
ELECTRICAL WORLD • JUNE 7, 1930



CORDELIA SUBSTATION, P. G. & E.

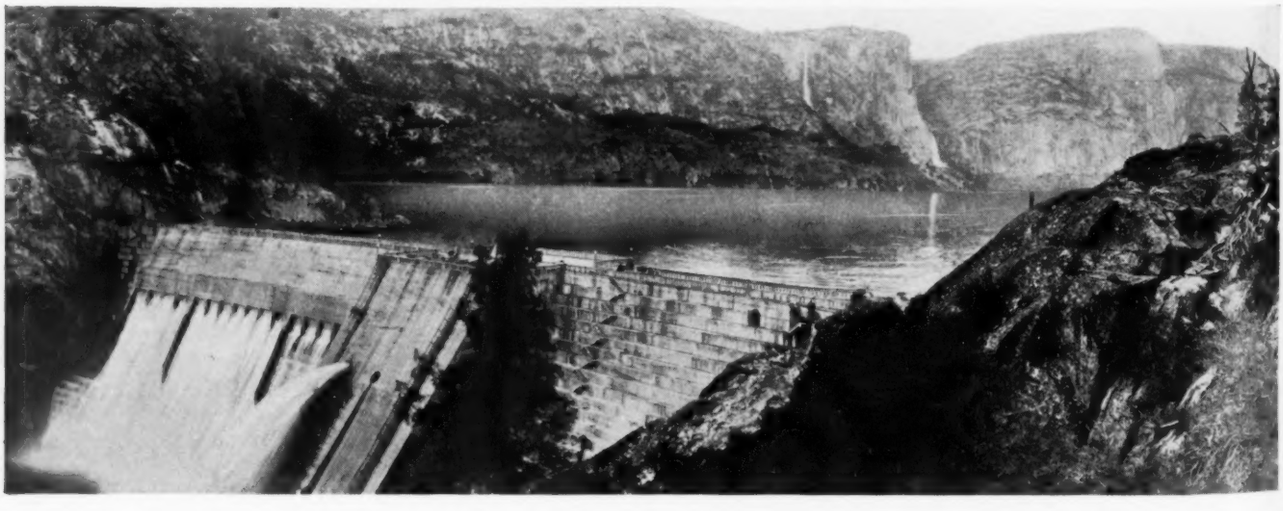
HALSEY STATION, P. G. & E.

CARIBOU, GREAT WESTERN POWER



KERN RIVER, SOUTHERN CALIFORNIA EDISON

O'SHAUGHNESSY DAM, SAN FRANCISCO'S HETCH HETCHY

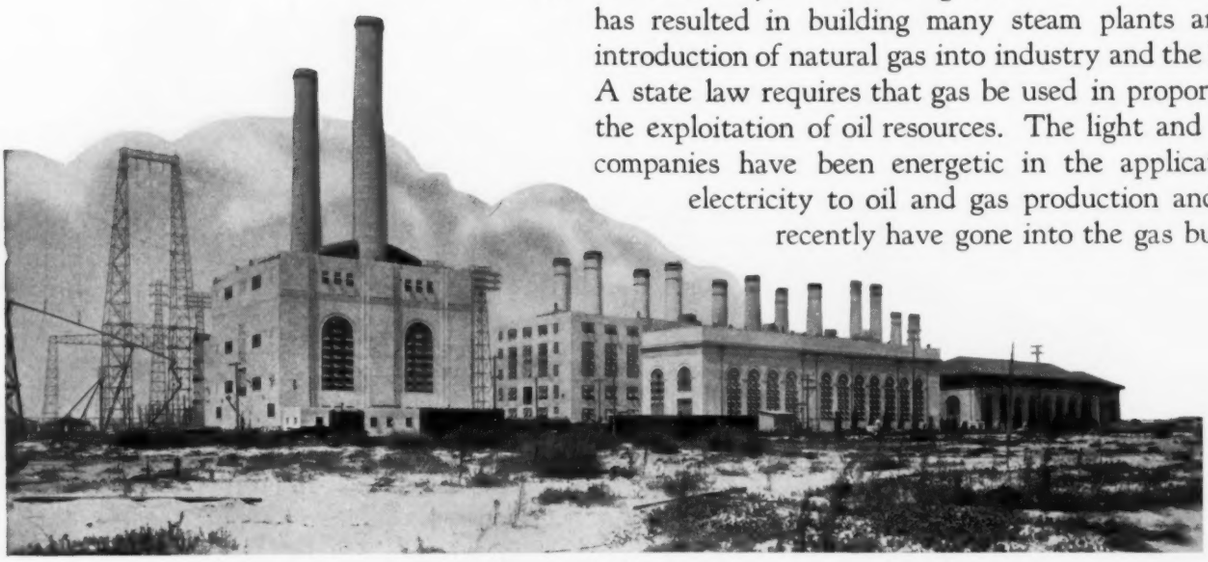


MANY of the notable hydro-electric and transmission achievements have been due to the electrical pioneers of California. The first 220,000-volt line was placed in operation by the Southern California Edison Company in 1923. In Pomona in 1891 electric power was first transmitted 28 miles at 10,000 volts.

The snow-capped Sierras have been the source of the water which has been instrumental in bringing about the agricultural and electrical development of central and southern California. More recently fuel-burning stations in the larger cities have been called upon to help develop electric power, so great is the demand for electricity in the land of sunshine and scenery.

Yosemite National Park, Graves Memorial Grove, Lake Tahoe are typical of the lavish endowment nature has given California and rapidly growing cities dot the state from north to south to attest its commercial and social progress.

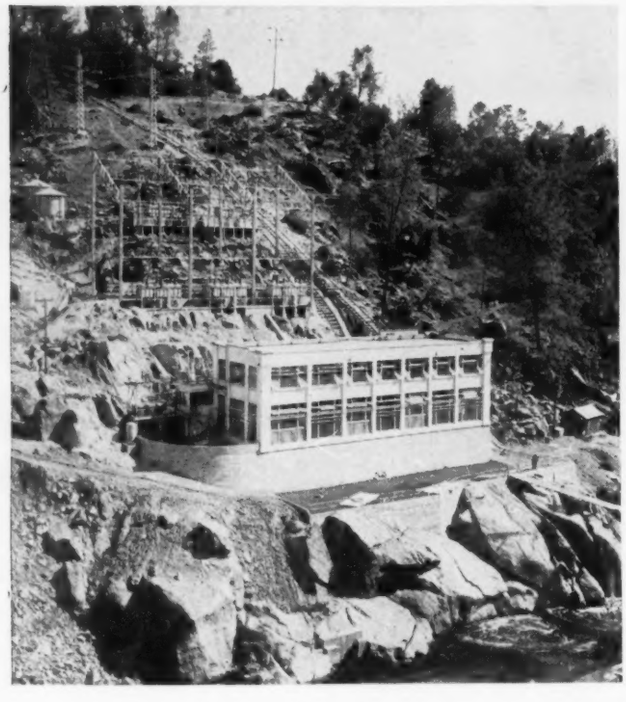
WHILE water power continues to be the chief source of electrical energy in California, the recent discovery of oil and gas in the coastal regions has resulted in building many steam plants and the introduction of natural gas into industry and the homes. A state law requires that gas be used in proportion to the exploitation of oil resources. The light and power companies have been energetic in the application of electricity to oil and gas production and more recently have gone into the gas business.



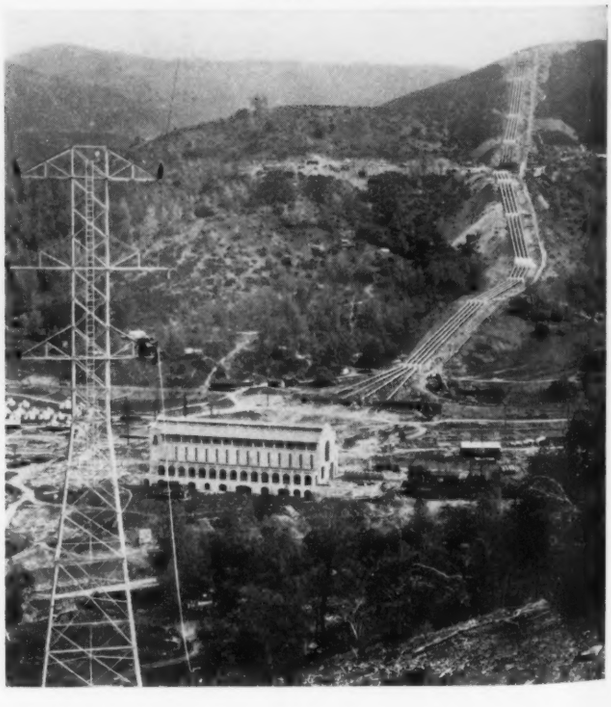
LONG BEACH STATION, SOUTHERN CALIFORNIA EDISON

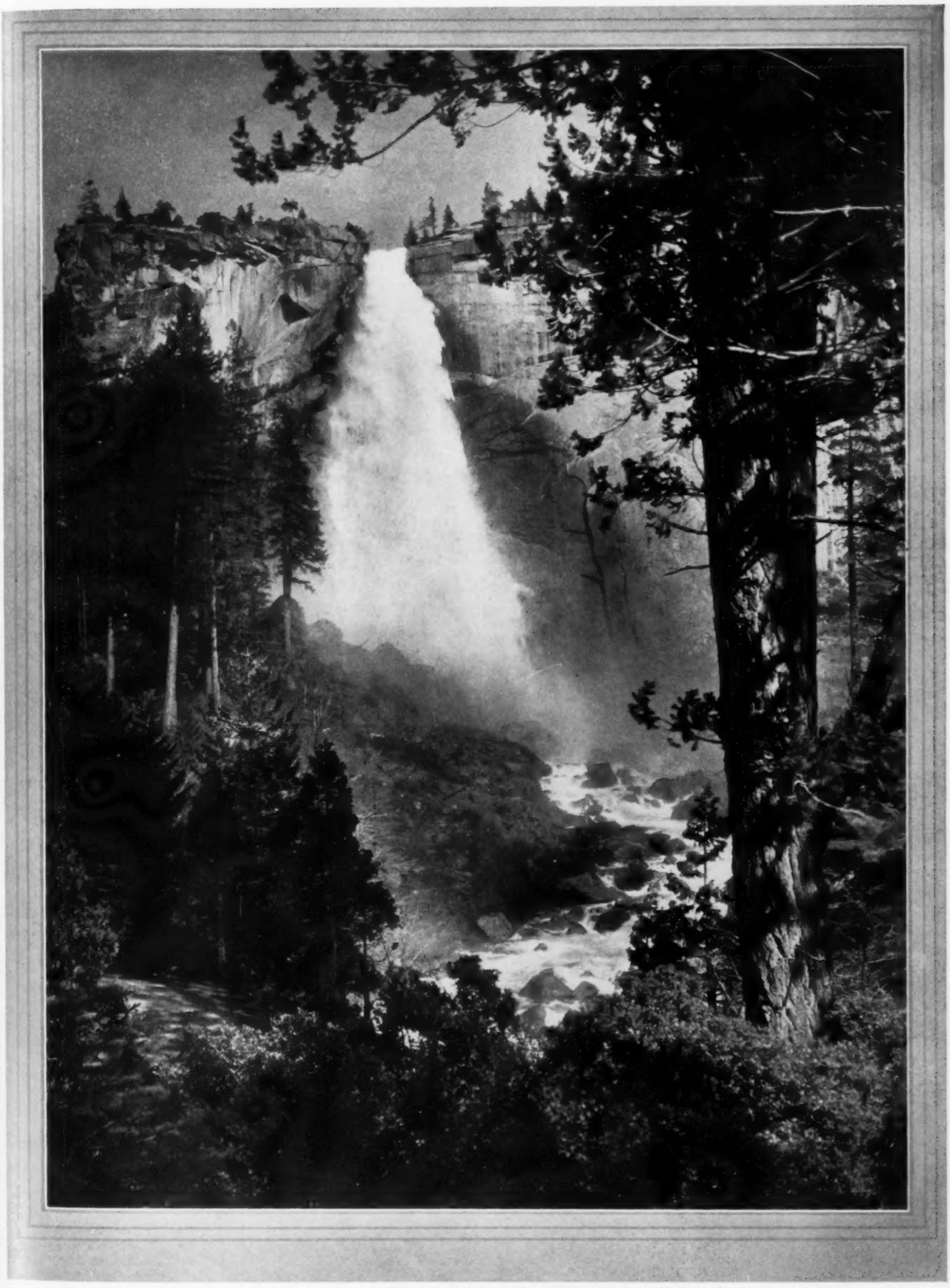
SAN FRANCISCO SKYLINE FROM OAKLAND

KERCKHOFF, SAN JOAQUIN LIGHT & POWER COMPANY

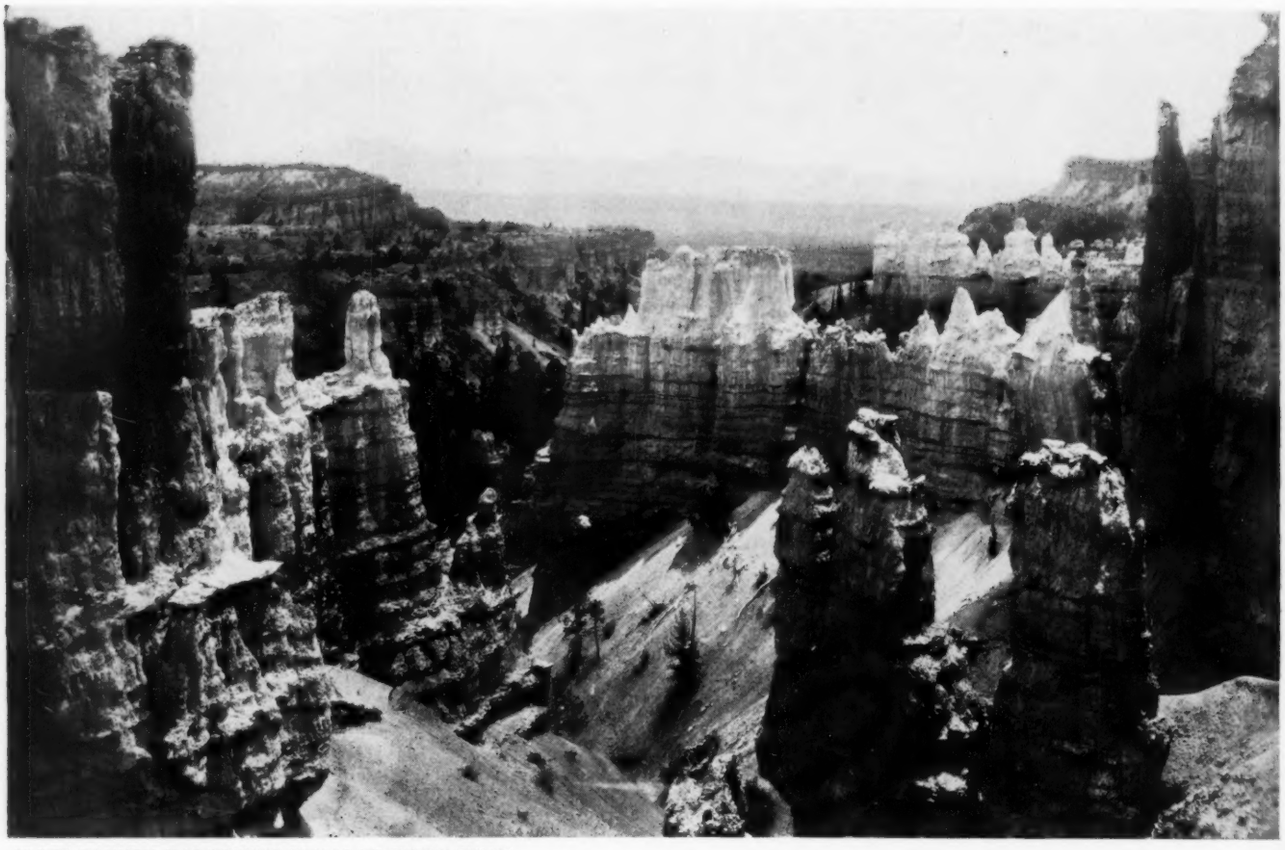


MOCCASIN, CITY OF SAN FRANCISCO



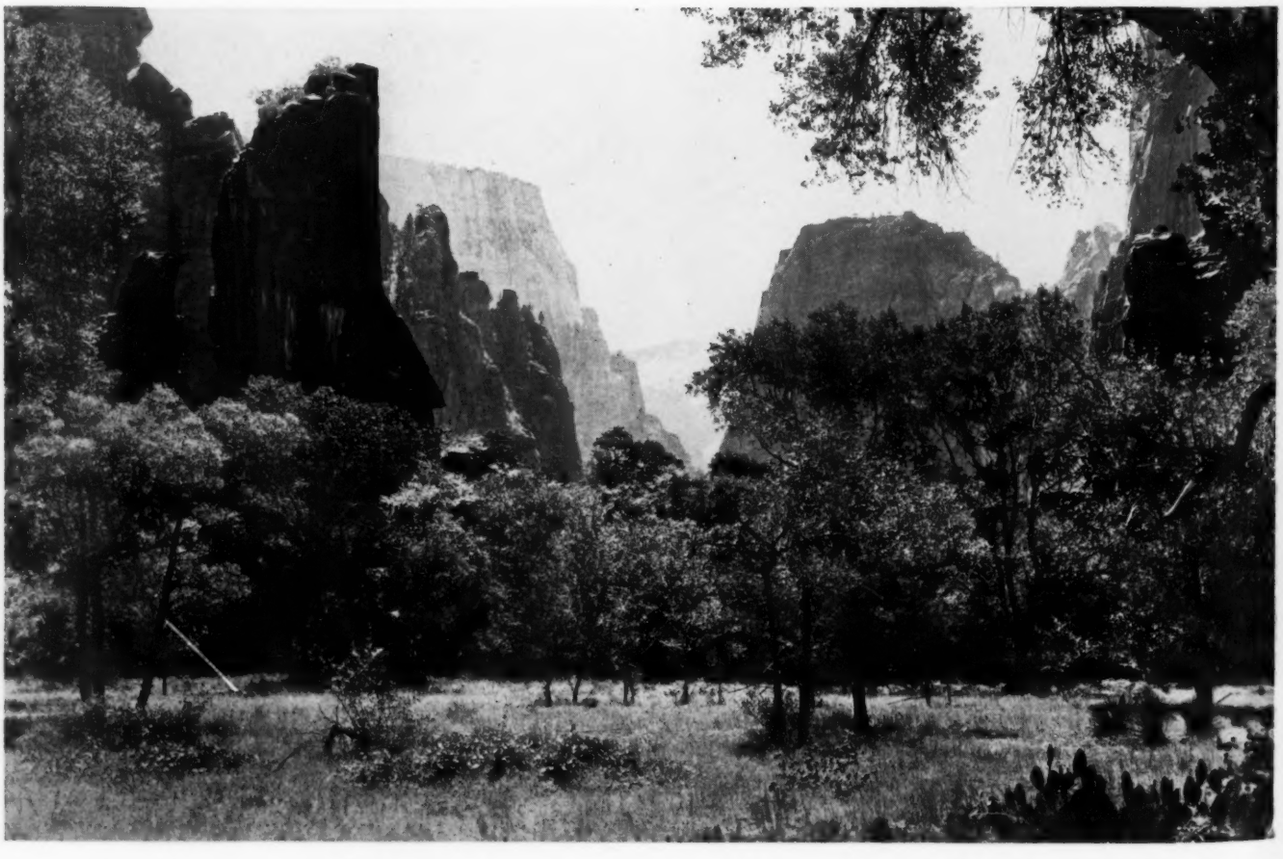


NEVADA FALLS
A TYPICAL SCENE IN YOSEMITE NATIONAL PARK—
A PLACE THAT EVERY AMERICAN SHOULD VISIT

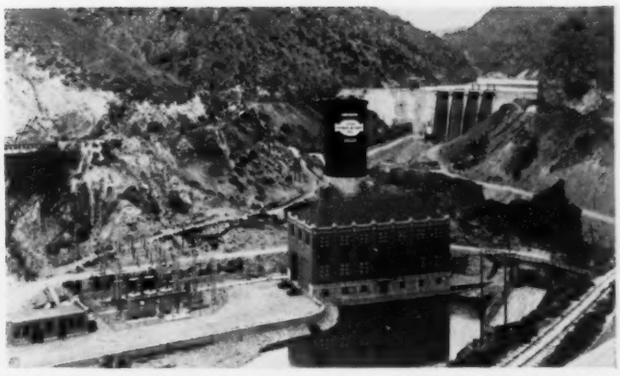


BRYCE CANYON HAS ERODED WALLS OF EVERY COLOR
WITH TURRETED PINNACLES OF FANTASTIC SHAPES

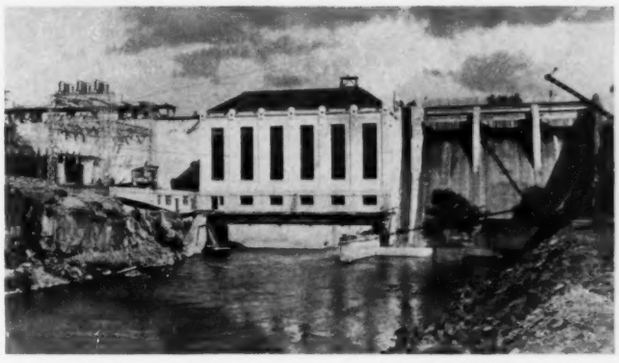
THIS TEMPLE OF SINAWAVA IS TYPICAL OF THE SCENIC
WONDERS TO BE FOUND IN ZION NATIONAL PARK



ONEIDA, UTAH P. & L.



CUTLER, UTAH P. & L.

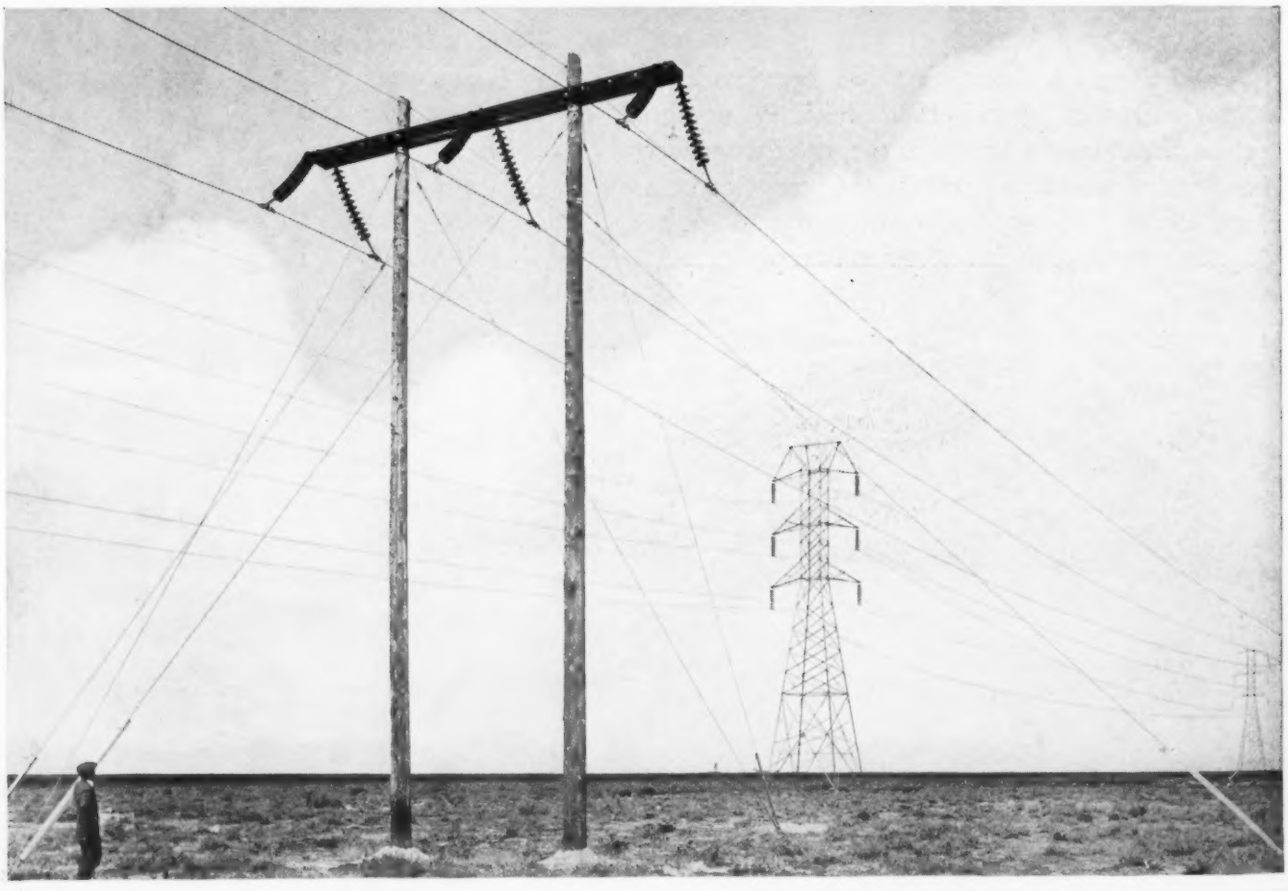


SODA, UTAH P. & L.

UTAH is a desert that has been made to blossom by irrigation. Melting snow in the high mountains furnishes the water for power and agricultural developments. Mineral resources and beautiful scenery in the many canyons add to agriculture to make this Mormon land prosperous.

BEAR RIVER CANYON IN UTAH

PIKE'S PEAK REMAINS A MECCA FOR COLORADO VISITORS



TRANSMISSION LINES ACROSS UTAH PLAINS

VALMONT, PUBLIC SERVICE COMPANY OF COLORADO

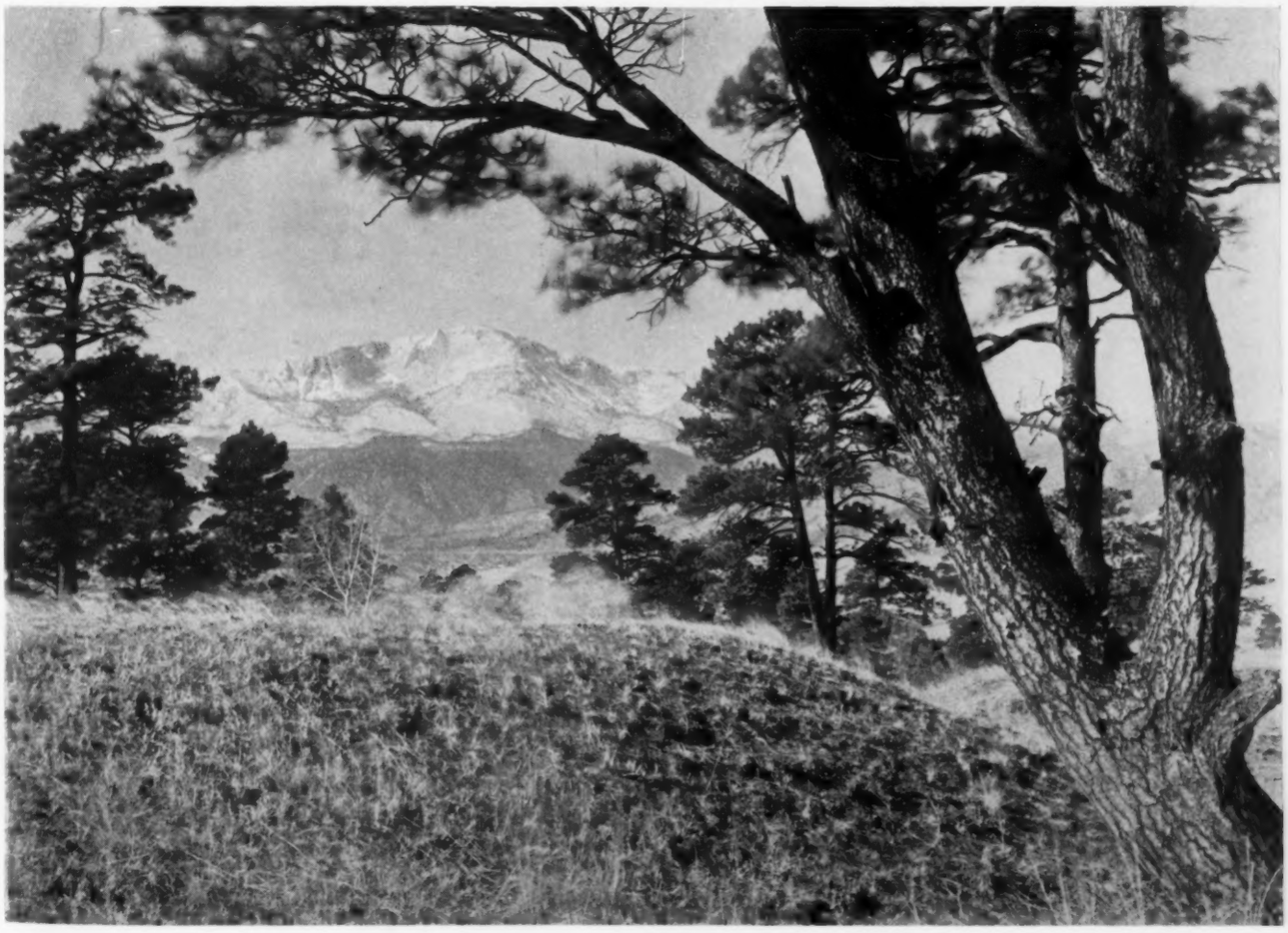
COLORADO calls to mind the golden days of mining, but today this state is developing its agricultural wealth. It is also a great playground where visitors find infinite variety in scenery in the mountains, canyons and mesas. Despite the heavy snow in the mountains hydro developments are small, since watersheds are restricted and runoff is rapid.

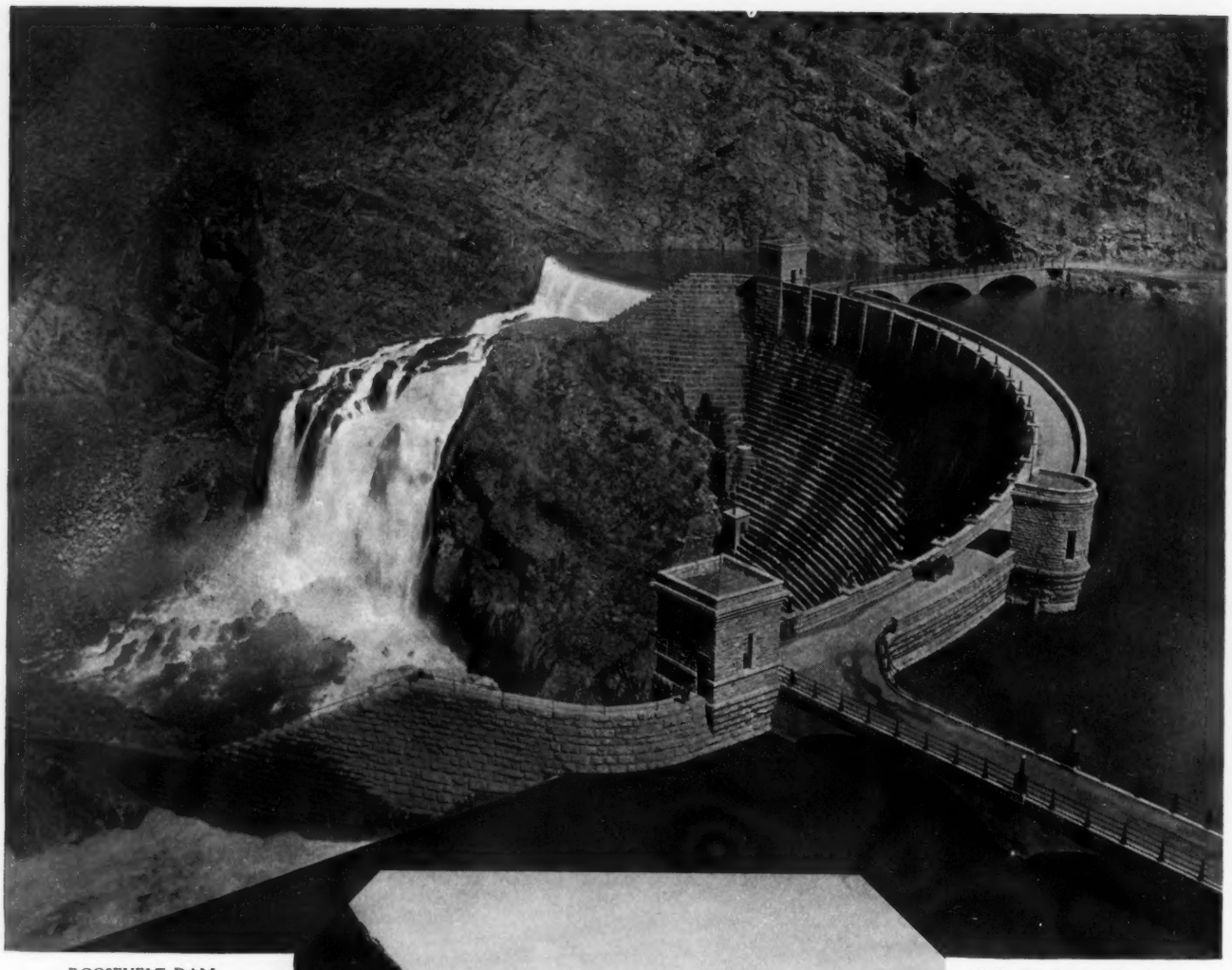
The mountain parks of Denver, Estes Park, the Pike's Peak region, Gunnison Canyon, Black Mesa—these Colorado bits of scenery attract thousands of visitors each summer and can be matched in beauty by others in less accessible locations. A revival of mining and the further agricultural development through irrigation are bringing prosperity to the scenic state once more.

BOULDER HYDRO STATION

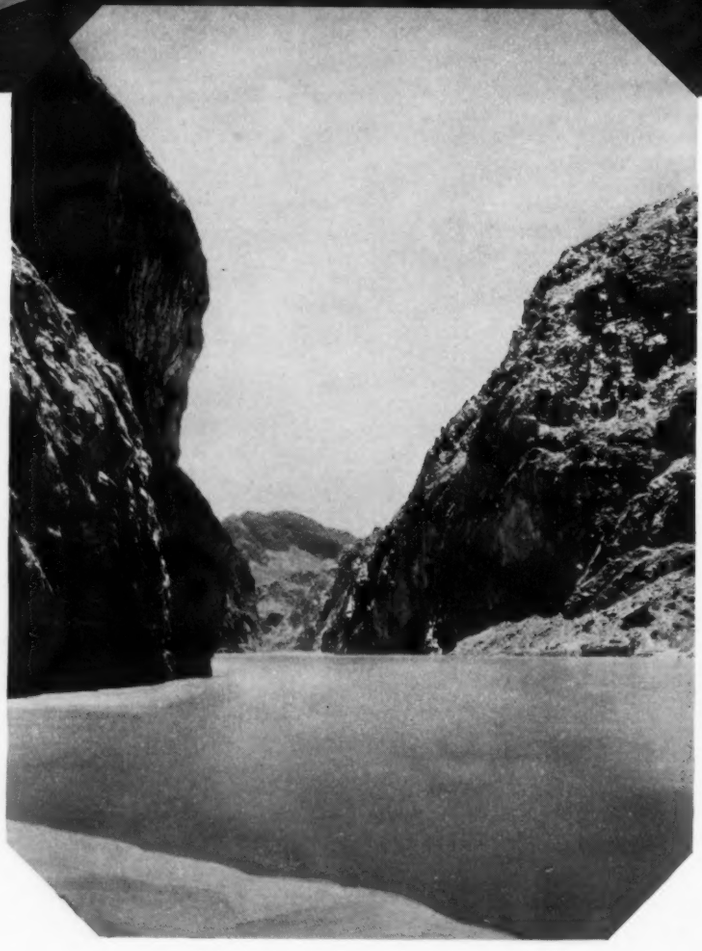
CATHEDRAL SPIRES—GARDEN OF THE GODS

MORE THAN 40 PEAKS REACH
14,000 FEET INTO THE COLORADO SKIES





ROOSEVELT DAM



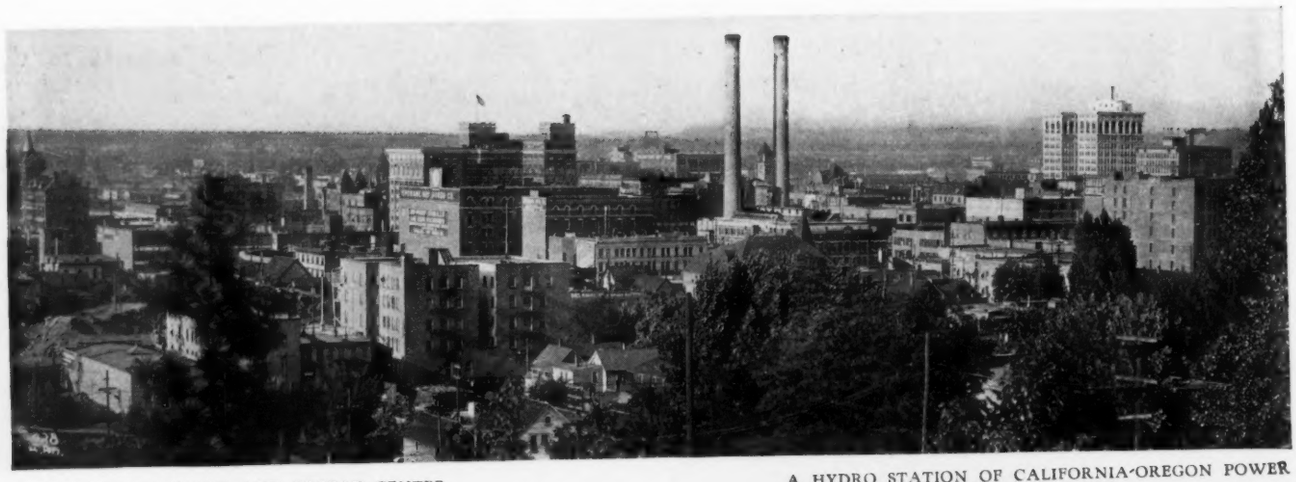
SITE OF BOULDER DAM

LAND in the sparsely settled southwest is arid, but deep clefts in the plains have been worn by many never-fail ng rivers and the government has concerned itself with developing combined irrigation and power projects. One of the largest of these is Roosevelt Dam and the one of great national interest is the proposed Boulder Dam development in the Grand Canyon of the Colorado River. Boulder Canyon will give 1,000,000 hp. in electrical energy and will serve to control flood waters that often bring disaster to the irrigated lands in the Imperial Valley.

ENTERING GRAND CANYON

KAIBAB FOREST

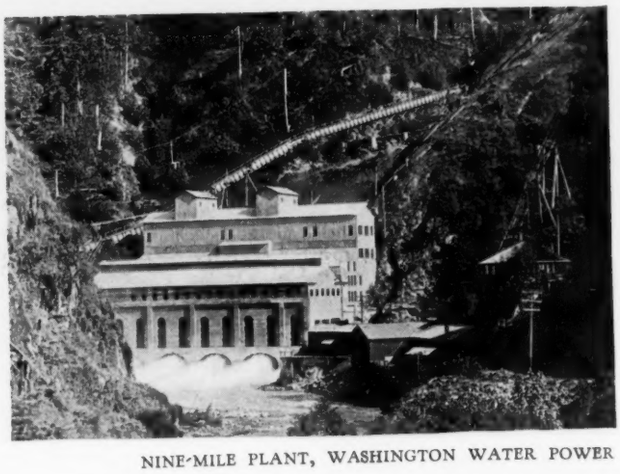
GRAND CANYON OF THE COLORADO



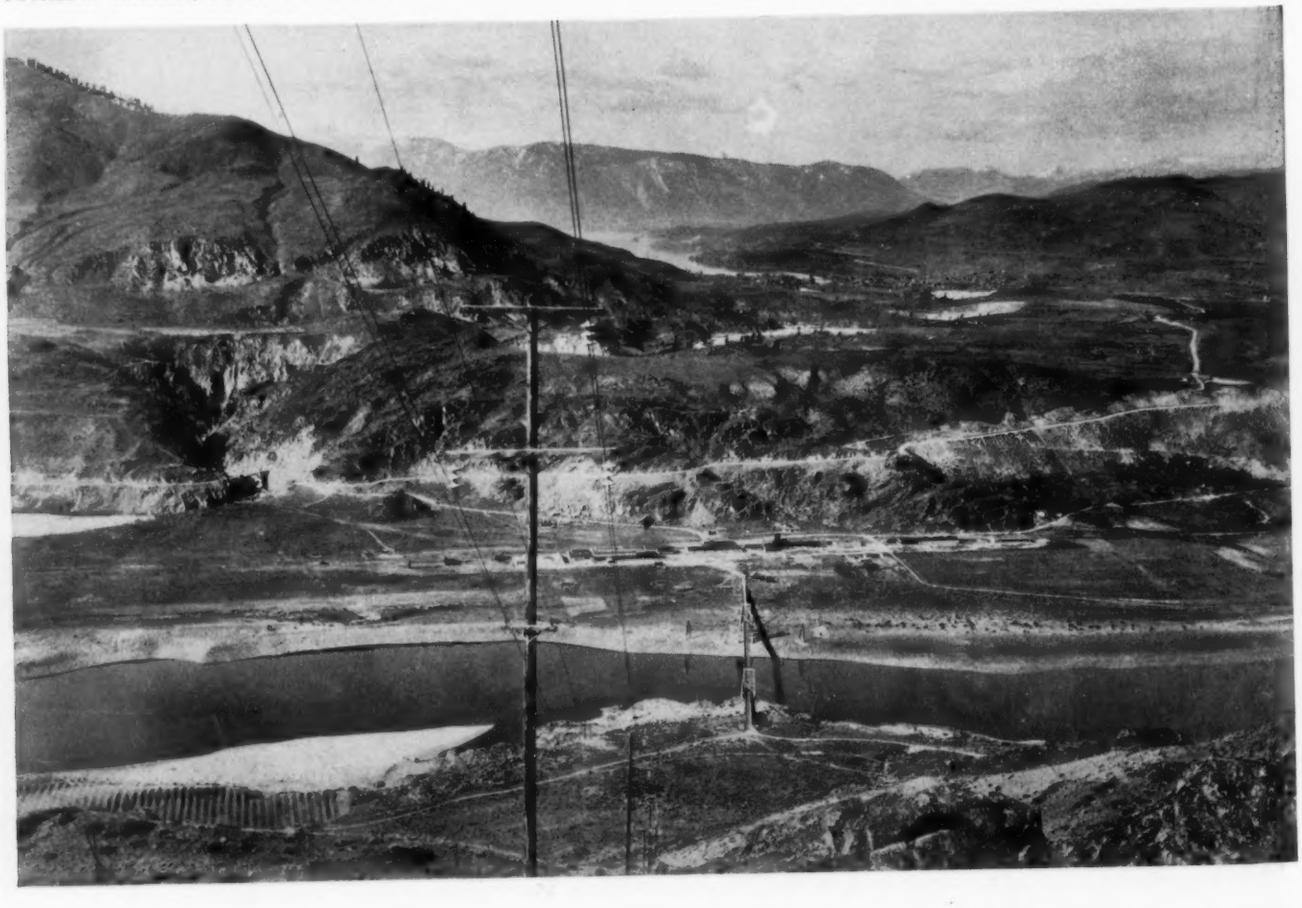
SPOKANE—A LUMBER AND WHEAT CENTER

A HYDRO STATION OF CALIFORNIA-OREGON POWER

PUYALLUP STATION, PUGET SOUND P. & L.



NINE-MILE PLANT, WASHINGTON WATER POWER



PARADISE INN IS THE START TO SCALE THE 14,444 FEET OF MAJESTIC MOUNT RAINIER, NEAR SEATTLE

WASHINGTON AND OREGON call to mind timber, fruits and agricultural products and in addition the mountain and river scenery that attracts visitors from all parts of the world. It is a land of water power because of the many rivers fed by never-failing snow supplies.

POST FALLS ON THE SPOKANE RIVER

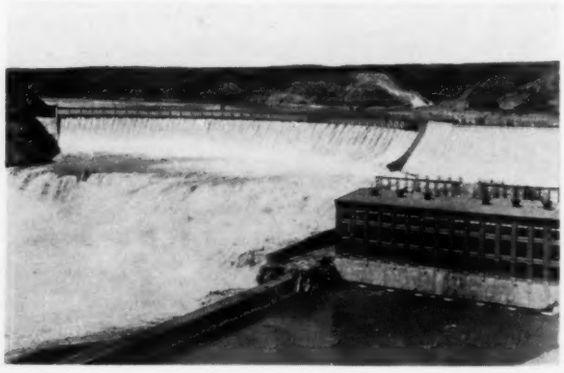
PROSPECTING FOR SNOW

MONTANA, WYOMING AND IDAHO depend upon water power for electricity. Barren plains, immense forests and beautiful scenic spots mark this little-known region. Yosemite National Park and Glacier National Park afford scenery that cannot be duplicated. Electricity finds greatest use in mining, railroad electrification and electrometallurgical applications.

YELLOWSTONE FALLS IN THE
MULTI-COLORED YELLOWSTONE CANYON

HYDRO STATION, IDAHO POWER

GREAT FALLS, MONTANA POWER



RAINBOW, MONTANA POWER

LAKE LOUISE,
GEM OF THE ROCKIES

Across the border lies Canada, where the scenery around Banff attracts thousands each summer. The inaccessibility of this region and that of Glacier Park permits only of sampling by the hurried travelers.

SWAN FALLS,
IDAHO POWER

Selling the Homes

Need for changed industry sales organization apparent. Trends surveyed and future moves suggested by

L. W. W. MORROW

Editor ELECTRICAL WORLD

THE electrical industry agrees that the domestic business affords a splendid market. Its possibilities have been measured time and again. Devices and services for sales to the homes have been developed and made available to purchasers. Sales efforts have been sustained, and conscientious inducement rates have been instituted more rapidly than needed by sales pressure and each unit in the industry has voiced its desire for the business and directed its actions accordingly.

Yet the progress that has been made is disappointing, especially as regards the use of the heavier duty appliances. An average revenue of $30 a year per customer and 500 kw.-hr. does not mean great progress over the years when compared to a revenue of $154 a year per customer with a corresponding use of 5,400 kw.-hr. as a reasonable market saturation.

Only from 1 to 6 per cent of the 20,000,000 domestic customers use refrigerators, ranges, water heaters and ironers. Off-peak house heating, household cooling and ventilation and other services that could be used by an appreciable number of 30,000-kw.-hr.-per-annum homes are yet only possibilities. If facts are studied it will be found that the industry has not even kept pace with the annual increments of new residential customers. The utilities are doing a $700,000,000 business, when they can reasonably expect a $1,750,000,000 business. They sell 10,000,000 kw.-hr. when they can sell 54,000,000,000 kw.-hr. if only 50 per cent of the customers used electric service properly and economically. Appliance manufacturers face a comparable business situation.

What are the reasons for slow progress in market development?

They are not far to seek. The industry has grown rapidly and each service and appliance has been developed at different times and sold by individual agencies. Each appliance manufacturer invented, built and marketed his own product. *Each set up a national sales organization to sell his own product to the home.* Then again, initially, his product may have cost $10 to manufacture and he retailed it to homes for $100; then competitors developed and the spread may have been forced down to that corresponding to a retail price of $50, so that profits diminished and sales volumes were reduced.

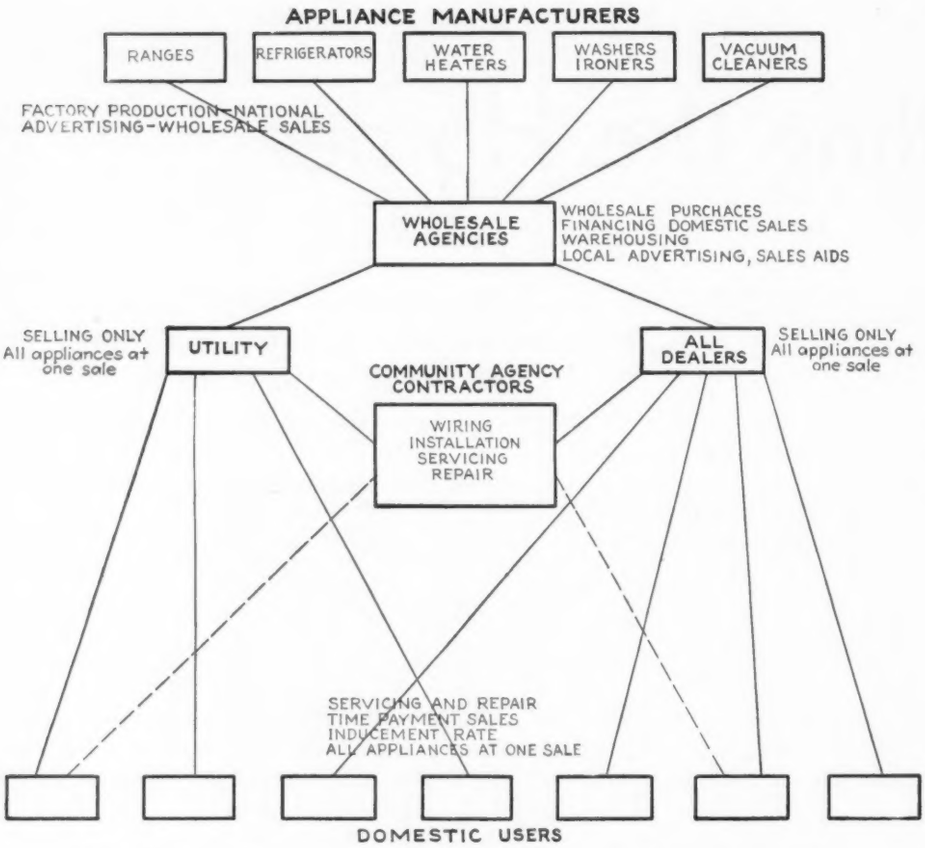
There is little system or co-ordination in attempts to sell the market. The typical home is sold piecemeal and from time to time by each of a multitude of sales agencies for individual products. Each product makes it necessary for the home owner to contend with wiring, installation, metering and rates. Time-payment plans are dissimilar and fail to meet the competition of other industries for the consumer's dollar. *It is too much trouble for the home owner to buy complete electric service. The industry distribution and sales organization is too cumbersome, slow and expensive to get home sales economically or in volume. Without so intending, the industry has made it difficult for home dwellers to buy and use its products and services.*

The conclusions are inevitable that industry selling organization and practices are faulty. Surely the devices and the services have merit! Some new thought and action are now being brought forward to better conditions. Rumblings of this are now apparent. The plan of the Central Hudson Gas & Electric Corporation described in this issue, the Courtright plan in California, methods used by British Columbia Electric Railway and even the remodeling of the jobbing units of Graybar, General Electric and Westinghouse afford evidence that a new distribution and sales picture is being outlined, even though the finished painting is obscure.

Just from the dollar angle it is interesting to study an individual home from extreme points of view. The basis of study may well be the present average of a home compared to the same home with a refrigerator, range and water heater added. The customer is assumed to pay $30 a year for his present 500-kw.-hr. use and he requires a total system investment of $400. Two cases will be assumed—one based on the safety razor business and the other on exaggerated sales expenditures:

Case 1. Assume the utility gives away and installs free of charge a range, water heater and refrigerator in each home.—Assume 6 cents for refrigerator, 3 cents for the range and 2 cents for the water heater, with corresponding annual consumptions of 400, 1,500 and 3,000 kw.-hr. per customer. Assume the utility buys these appliances for $300 and depreciates them on a ten-year life. Assume total installation charges are $150 and additional system investment resulting from their use is $150. Then a comparative balance sheet might appear as follows:

(*a*) *Present Use:*		
System investment per customer		$400.00
Annual kilowatt-hours per customer		500.00
Annual revenue per customer		30.00
Per cent revenue to investment		7.5
(*b*) *Full Use:*		
System investment per customer		$1,000.00
Annual kilowatt-hours per customer		5,400.00
Annual revenue per customer		154.00
Per cent revenue to investment		15.4
Added energy cost at ½ cent	$24.50	
Depreciation charge, ten years	30.00	
Added system investment at 6 per cent	18.00	
Increment charges for full use	$72.50	
Net revenue for full use $154 — $72.50		$81.50
Per cent net revenue to investment		8.15



Typical community organization for complete domestic service

At least no appreciable loss would be incurred by the utility if these heavy-duty appliances were given away to customers. Appliance manufacturers would get a volume of business aggregating 10,000,000 of each type of appliance or $300,000,000 in wholesale sales on the basis of only 50 per cent domestic customer sales.

Case 2. Assume the same data, but that the utility installs the appliances free of charge and spends $100 per appliance in order to sell these appliances to the customer who pays list price for them.

(a) Present use balance sheet appears as before.
(b) Full use balance sheet is as follows:

System investment per customer	$550.00
Annual use per customer, kilowatt-hours	5,400
Annual revenue per customer	154.00
Ratio of revenue to investment	28 per cent
Added energy cost at ½ cent	$24.50
Added system investment $150 at 6 per cent	9.00
Added interest charges $450 at 6 per cent	27.00
	$60.00
Net revenue for full use $154 — $60.50	$93.50
Per cent net revenue to investment	17.2

Thus free installations and $300 per customer sales expense make the domestic business twice as profitable as it is at present.

Any one may well challenge the values used and is free to make different analyses, but all this will still lead to the conclusion that volume sales in the domestic market are desirable and can be made profitable. *It is as incorrect to assume that these appliances will be given away as it is to assume no money will be spent to sell them.*

What, then, should be done to establish an economical method for making sales to the domestic market?

It is apparent that an industry organization should be established that will send an agent to each home equipped with a sales plan that is complete for selling each home dweller the electrical appliances and services he can use profitably and conveniently and in addition the industry should provide for a resurvey of each home at least once a year and, finally, establish a maintenance and service agency for the convenience of the home dweller.

Each home should be visited once a year. Each home should be sold all appliances and services it needs or can use at the time of each visit as a one-sale accomplishment. Each home should be provided with a repair and maintenance agency available promptly at call. Each home dweller should be able to predict both his appliance and energy costs and pay them on installments if he so desires.

It should only be necessary for the home dweller to say "I agree" to the industry sales agent's proposal. Electric services and appliances should be made convenient to buy and to use. Idealistic, of course, but containing some thoughts that might be made into a practical working mechanism that would approach the ideal in time!

What industry organization can be used to get sales in volume economically?

Brief suggestions for approach to the ideal set-up are as follows:

1. In each community or territory one or more wholesaling or jobbing units should be established. These will act to purchase all appliances at wholesale that will be sold in the territory. They will warehouse the appliances. They will arrange to finance or carry all domestic customer time-payment paper. They will give sales aids to sales outlets in the form of co-operation in advertising and demonstration.

2. Each community should have an inducement rate that will encourage appliance use and, in addition, a uniform time-payment plan available to all customers. It may well be that the combination of these two can be had such as the $30-a-month five-year rate of the Central Hudson Gas & Electric System.

3. Co-operative sales relations should be established between sales agencies so that uniformity will exist as to terms of payment, requisitions for appliances, advertising of a certain type and so that each sales outlet can sell each home on a one-sale basis. Quality of prod-

uct and differences in design of product will give the customer a choice and competition that is constructive. and introduces competition.

4. For each territory or community it would be well to establish a common organization to do all installation, service and repair work for homes. Uniform schedules for installing and servicing should be adopted.

5. Each home should be a market approached by each individual sales outlet backed by a behind-the-scenes industry organization and plan including demonstrations

A step-by-step program

No general plan can be made that will apply to all communities—there are too many variables. It would take time to develop the ultimate schemes in any region. *But in some measure the basic ideas could be started to work to reduce costs to home buyers and to augment sales to this market.*

In a small town with no dealers available at present, possibly the utility is the logical unit to develop the plan. In larger communities the utilities, jobbers, dealers and contractors might work together to develop a workable scheme. Manufacturers might well study the possibilities for affiliating with available territorial agencies. It all depends upon the local conditions that are encountered.

But the goal is an appliance business and an energy use in homes ten to forty times that now available. This volume should use all present industry units, but they must be welded together differently. The economic pressure is here to create industry changes. The market is known, the present set-up is not exploiting it and some moves are being made already to change the present sales and distribution set-up. Would it not be well for the industry as a whole to take stock and plan for the future so that dislocations and irritations will be reduced to a minimum? There is all to gain and nothing to lose.

Domestic Consumption Increased 768 per Cent in Eleven Years

By FRANKLIN T. GRIFFITH

President Pacific Northwest Public Service Company

PRACTICALLY all of the industries of the Pacific Northwest are motorized, and one of the opportunities for load building, which was begun before the war and vigorously pushed since, has been the domestic field. As all residences within reach of our lines are wired for electric service at the time of erection, the problem has been one of increasing domestic consumption rather than inducing home owners to use electric service. This domestic load building program has been carried on in co-operation with all agencies, particular attention having been given to building electric range load. The success of this program may be measured by the following figures:

For the year 1918 the annual average consumption per domestic customer was 245 kw.-hr., the average revenue per domestic customer $16.66 and the average rate per kilowatt-hour earned by these customers was 6.8 cents. For the year 1929 the average annual consumption per domestic customer was 945 kw.-hr., the average revenue per domestic customer $31.60 and the average rate per kilowatt-hour earned by these customers was 3.35 cents. In 1918 8,999,972 kw.-hr. were sold to domestic consumers, as against 78,097,324 kw.-hr. in 1929, an increase of 768 per cent. In 1918 the total revenue from domestic customers was $620,222, as against a total of $2,615,060 in 1929, an increase of 321.6 per cent. In 1918 there were 540 electric ranges connected to our lines, while we now serve in excess of 15,000 electric ranges, our range saturation having grown from approximately 1.4 per cent to better than 17 per cent during this period.

In addition to our domestic load-building activities, we have not neglected developing rural territory, as indicated by the fact that we have 1,600 miles of rural lines serving approximately 16,000 rural customers, of which 7,300 are farms, as defined by the U. S. Census Bureau. We are looking forward to a greater development for the electric range and water heater and expect to reach a saturation of 50 per cent of our customers within the next ten years.

Full-Use Electric Home

By E. R. ACKER

General Commercial Manager
Central Hudson Gas & Electric Corporation,
Poughkeepsie, N. Y.

ELECTRICITY cannot perform its full service in the household unless the home is adequately wired and properly equipped with appliances. Most old homes are inadequately wired, and instead of a complete modernization and adding the necessary wiring and appliances completely to electrify if the owners are compelled, either by the high cost of appliances or the lack of an adequate financing plan, to install one major appliance at a time. This method requires seven or eight years for the complete electrification of the home.

Our company has overcome this difficulty by making available to its customers a new plan, whereby the average customer can install all of the appliances at one time which are necessary to make a complete electric home. This plan calls for one monthly payment, including the appliances and the electricity, and is based upon the idea that we are selling a service and not kilowatt-hours.

Experience in our territory indicates that a fairly large number of our customers would be willing to pay $15 per month for electric service and an equal amount for the purchase of appliances, a total of $30 per month. Electric refrigeration, water heating, cooking, lighting and the normal household services can be supplied for the average home under our "full domestic use rate" for approximately $15 a month.

Our plan calls, therefore, for a payment of $30 a month, which is made up of $14.31 for current and $16.69 for the amortization of the appliances, with an allowance of 7,000 kw.-hr. a year for the operation of these appliances. If any excess is used over and above the 7,000 kw.-hr. it is adjusted at the end of the year on the basis of 2 cents a kilowatt-hour, which is the low block in our "full domestic use rate."

Under this plan major appliances as listed below can be purchased to make either a complete electric home or to complete an electric home where the customer has one or more of these appliances already installed. This plan provides that the customer will pay for the entire cost of the appliances, including financing, installation, etc., and that this cost shall be amortized in not over five years. The number of months for which this payment of $30 must be made is set up in curve form for ready reference of the salesman. If the customer purchases the full complement of appliances $30 a month payment must be made for the full five years; if he already has certain appliances he makes the $30 payment for a sufficient number of months to amortize the full cost of the reduced number of appliances.

In case a customer wishes to sell his home or move away for any reason, arrangements will be made to either transfer this obligation to the new owner or make any other adjustment which will be mutually satisfactory to the company and the customer.

In operation the dealer will actually sell these complete electric homes under our guidance. When the dealer finds a customer whom he believes could be interested in a complete electric home he will first check the credit with the company to find out if it would accept a full electric home agreement from this particular customer and will then proceed to make the sale direct to the customer, with the help of the company's representatives.

When the customer has been properly sold, his credit approved by our company and the customer signed up on one of our special contracts covering this electric home set-up the dealer will turn this agreement over to our company for acceptance. When the contract is accepted and proof delivered to us by the dealer that these appliances are installed and in satisfactory operation, we will pay the dealer the full cash price of these appliances (less 1½ per cent for collection costs, etc.), as outlined in the complete electric home contract, and reimburse ourselves for current consumption and appliances from the monthly payment of $30 a month.

Background for the plan

As a public utility we are particularly interested in the development of our industry, including its allied trades, for the best service to the communities in which we operate. The utility, the electrical contractor, the heating contractor, the plumber and the gas and electric appli-

ance merchant are all bound together to a greater or lesser extent in a relationship with the user of gas or electric service.

We believe that one of our principal functions in serving the Central Hudson region is to make possible the full use of gas and electricity in the modern home, and in that connection to assume the leadership in the development of new uses for these services. In our opinion, however, the actual retail sales relationship with the consumer can be handled to the best interest of every one concerned by a host of retail dealers or merchants throughout our territory, who are conveniently located and prepared to offer merchandise which fully meets individual and community needs. In most cases the electrical appliance business added by these dealers is "increment business" done on existing overheads.

With reference to this whole question of the promotion of the modernization of the home, we feel, of course, that the public utility should co-ordinate itself with all other agencies in the community which can contribute to the advancement of comfort, convenience and economy in the homes of our customers. We are at present developing plans for the organization of all of these interests which are allied to our own problem, so that the group as a whole may represent a united industry and develop co-ordinated plans for the promotion and development of the modern electrified home.

Started merchandising of necessity

Some years ago we developed an intensive merchandising activity to meet a situation which was not being adequately met by existing dealers. At the same time we organized our electrical contractors into electrical leagues, for the promotion of adequate wiring and better service to the customer. These electrical contractors merchandised to some extent, but naturally found themselves in keen competition with the salesmen of our own company, who had great selling advantages over them. During the past several years the merchandising of electrical appliances has become so general in practically all classes of stores that we saw the opportunity to stimulate the sales of appliances through co-operative merchandising and also to reduce the cost to the community as a whole of selling these appliances. We reached the conclusion that the determination of who should sell the appliances should rest entirely on the question as to how the merchandise could be sold in the greatest quantity and at the lowest cost to the community. It appeared that there were a large number of sales outlets which could be developed co-operatively and therefore a great amount of sales effort which could be mobilized in our territory to promote the sale of electrical merchandise. We developed, therefore, a co-operative merchandising plan which we entered into with the electrical contractors which allowed them to sell with us, we giving them various sales aids, warehousing facilities, financing facilities, etc. Our own salesmen continued to sell, however, during this first development period, during which we tested out the validity of our ideas. The activity was so successful that early in 1930 we stated that we would withdraw our salesmen entirely from the retail sale of electrical appliances.

We had built up during the year 1929 a group of co-operative dealers, all of whom handled the same type of merchandise which they purchased through us, and all of whom were enthusiastic over the activity. Having

NEW thinking about modernization of the home has been followed by acts. In the March 15 issue of *Electrical World* the "One-Sale Plan" of the British Columbia Electric Railway Company was published. This involved a single sale by the utility to each home and an installment payment plan for customers financed by the utility.

IN THIS ARTICLE a different plan is outlined as developed by the Central Hudson Gas & Electric Corporation. It is a one-sale plan to each home based on dealer sales and the co-operation of the utility in sales, in appliance purchasing, installment financing and rate making. The plan has many unusual features of interest. The objects of all these developments are to get homes modernized at a rapid rate in the most economical manner.

CONCLUSIONS as to the merits of the plan must await further experience, but the fact that this plan and others are being tried out is indicative of radical changes and economies in distribution and sales. Distribution methods will be improved, costs will be reduced and, above all, sales will be increased so that the advent of full-use electric homes in large number will be made possible. Each of the plans published deserves the serious study of all electrical men.

—Editor.

List of Appliances Required in a Complete Electric Home

1. Electric refrigerator.
2. Electric washing machine.
3. Ironer attachment for washing machine.
4. Vacuum cleaner. 5. Electric range.
6. Electric water heater. 7. Coffee percolator.
8. Toaster. 9. Hand iron. 10. Waffle iron.

Full Domestic Use Rate

Applicable to Use of Service For:
Household purposes at residences of private families of all communities.

Character of Service:
Continuous, alternating current, single phase, approximately 112 volts, 60 cycles.

Rate:
Monthly Facilities Charge: 75 cents, plus 20 cents per counted room, plus
Energy Charge: Three and one-half cents per kilowatt-hour for the first 250 kw.-hr. per month and 2 cents per kilowatt-hour for additional energy.

Minimum Charge:
The monthly facilities charge, except that the monthly minimum charge shall be increased by $1.50 when service is provided for a range, $2 per horsepower or fraction of connected capacity in excess of 2 hp. power in motors other than for appliances when service is provided for such motors.

For customers served from rural extensions constructed subsequent to June 15, 1926, the minimum charge shall not be less than that determined in accordance with the "Rural Extensions" Rule.

Terms of Payment:
Bills will be rendered monthly with the addition of 5 per cent of the first $20 and 2 per cent of the amount in excess thereof, but in no event less than 10 cents and will be discounted by the amounts so added if paid within ten days from date rendered.

Term:
Self-renewing, yearly contract.

Determination of Counted Rooms:
(a) The number of rooms is to be determined upon inspection by the company's representative; no house is to be considered as having less than four rooms, and rooms of more than 300 sq.ft. in area are to be counted as two rooms.

(b) Rooms are classified in accordance with architectural design, not temporary use, whether wired for electricity or not, omitting bathrooms, cellars, basements, unfinished parts of top floor of house sometimes called attics or garrets, reception halls less than 120 sq.ft. in area not counting the projected area of stairways, toilet rooms, closets, porches, whether inclosed or not, laundries, pantries, pump-rooms, plant conservatories, hallways, rooms in garages and stables which are not living quarters, storage sheds, unfinished rooms and bedrooms as follows: Second and third, fifth and sixth, eighth and ninth, eleventh and twelfth, fourteenth and fifteenth, etc.

Additional Provisions:
(a) Water heaters served at the foregoing rate shall conform to the following conditions:

1. Connected load of heating elements not less than 1 kw. nor more than 2 kw.
2. Capacity of storage tank not less than 50 gallons.
3. Two or more heating elements with separate automatic thermostatic controls.

When water heaters not conforming to such conditions are installed, the above rate shall be modified so that its energy charge shall be 3½ cents per kilowatt-hour for all energy taken under this classification.

(b) No range, other heating appliance or motor installation of aggregate maximum demand in excess of 5 kw. will be served under this classification.

in mind the best interests of the customer, we took the position that our withdrawal from the retail merchandising field was not for the benefit of any class of dealers and was not for the purpose of obtaining their good will. We stated that unless it resulted in the sale of more merchandise, at less total cost to the customer, we could not continue the activity. We made the point, therefore, that we must include among our co-operative dealers not only electrical contractors but any type of dealer who could sell electrical merchandise, and we actually have in the group grocery stores, small general stores in rural sections, hardware stores, electrical contractors, etc. I think we can say that we have been able to convince the electrical contractor that it is to his own interest to develop the strongest merchandising outlets in the territory because of the resulting stimulation of his specific field—the wiring business.

Acts as a jobber

Our present plan is to act as jobber on certain major electrical appliances to this group of co-operative dealers, to sell to them at discounts varying with the quantities purchased, to make available to them advertising aids and window display service, to keep in the field five supervisors who continually stimulate the dealer sales through direct contact, through educational classes with their salesmen, through personal aid to their salesmen, and so forth. The supervisors are paid a salary plus a commission, which is based upon the increase in domestic revenue in the territory which they cover, so that it is to their interest to stimulate the sales of not only the co-operative dealers but other dealers who for one reason or another do not wish to sell the particular type of merchandise which the co-operative group has selected. We keep in addition a record of the installed appliances in the homes of all of our customers. This record is kept up to date by periodic inspections of our own service men, meter readers, etc., or in some instances by canvassing arrangements with the dealers' salesmen. This information is open to all dealers and is the measure of the market which is used continually by our supervisors in stimulating the interest of the dealers.

We purchase the time paper of the dealers and by substituting a note for a sales agreement we have been able to make arrangements with our local banks by which they purchase these notes in quantity from us, charging us 6 per cent on the unpaid balance, with the understanding that we guarantee the payment of the notes. We, in turn, charge the electrical dealers 1½ per cent to cover the cost of accounting and the risk of accepting the paper without recourse.

In other words, I think we have in effect all of the elements of the group-selling ideas expressed in the editorial published in the March 15 issue of ELECTRICAL WORLD entitled "Selling Appliances in Multiple."

Rate devised for one-sale plan

Coincident with the development of our co-operative merchandising plans we realized the importance of selling the whole job at one time. We realized that we were under a considerable handicap in selling a full installation of electrical appliances, not only because of the resulting high monthly payments on account of the merchandise, but also because of the greatly increased bills for electric service coming at the same time. We devised, therefore, the "full-use electric home" plan, which allows a customer to purchase a full complement of

electrical appliances immediately and to pay the monthly amounts due on the merchandise and the cost of the current to operate them in one lump sum each month, over a period of five years. In other words, we install a full complement of electrical appliances, charging the customer $30 per month flat charge for a period of five years, and for that amount furnish all of the energy required to run the appliances, up to 7,000 kw.-hr. per year, and at the end of the five years turn the appliances over to the customer as his own. We already have twelve homes in our territory operating under this plan, and they are unanimous in their enthusiasm over its operation. One of these customers in particular has taken several hundred people through his home and has become one of our best advertising media. We authorized these twelve full-use homes on an experimental basis and have not intended to promote further sales intensively until we have had a full year's experience with this first group. They have been in operation now more than eight months, however, and we are prepared to say that the idea is sufficiently sound to promote actively this method of selling through our co-operative dealers, possibly paying a bonus for each full-use home sold. Our merchandising supervisors in the field will promote the plan actively.

Adjustments provided for

The customer pays 2 cents per kilowatt-hour for any usage over 7,000 kw.-hr. This adjustment at the end of the year will not be material, in our opinion. If the customer uses less than 7,000 kw.-hr. per year no adjustment is made. The $30 per month paid by the customer pays us for the 7,000 kw.-hr. per year billed at our full-use domestic rate and returns us at the end of the five years the full retail price of the merchandise, plus installation cost, plus the cost of financing the unpaid balance. The customer agrees to maintain or replaces the appliances at his own expense. At the end of the five-year period we will agree with the customer on some flat charge for electrical service, to be billed monthly, and stand ready to make an adjustment at the end of each year.

The plan is now in effect and we expect to promote it with the dealers. The plan as actually applied to the original twelve experimental homes, all of which are still in service, carries a monthly payment of $27.50 per month, rather than $30 per month. Under the $27.50 per month payment the company receives full payment for the kilowatt-hours used at the full domestic use rate, but does not receive the full retail price of the appliances, the difference being charged to new-business expense, this expense being justified, in our opinion, by the desirability of obtaining the full-use customer for the full five-year period. We do not feel that the modification of the charge in order to fit the plan in more fully with a co-operative dealer set-up will mean any material handicap to its promotion.

We feel that this is a pertinent time to state our experience to date, in view of the announcement of the plan of the British Columbia Electric Railway Company. It appears that we have carried the operation one step further and have made the set-up even more attractive to the customer. The plan as I have outlined it is the basic plan for a normal complement of electrical appliances. We will modify the $30 per month to take care of any special cases where the customer wishes to install larger appliances than those called for in the basic plan. We have had sufficient experience with the plan to make us believe it will aid greatly in modernizing the homes in the region we serve.

Glimpse of famous Kettleman Hills oil field

Two wells alone in this field are producing sufficient natural gas to operate a 1,000,000-kw. power plant continuously. Natural gas is bringing about a new industrial and economic era in California

Clyde Sunderland Photo

ELECTRIFYING Western Industries

Few isolated plants remain and industries are highly electrified. Industrial heating offers greatest field. Serious natural gas competition looms on the horizon

WITH few isolated plants remaining on the Pacific Coast and almost complete electrification of such industry as there is to be found in that section, industrial power engineers of the utility companies have had to develop new uses and seek new applications to expand their power market. Such additional energy sales as have resulted are traceable to one of the following factors: New industries locating on the Coast; expansion of existing industrial plants; elimination of isolated plants; electrification of the lumber industry; oil field electrification; irrigation pumping, and industrial heating and lighting. Considering the fact that the far West is not primarily an industrial territory and that the utility sales engineer can exert only limited control over the several factors influencing power sales, the power companies of that section have done a creditable load-building job.

Total energy sales of nine of the large central stations of the Pacific Coast increased 108 per cent in the seven-year period from 1922 to 1929. Eliminating domestic consumption, there was an increase of 101 per cent, which represents new power, industrial heating and commercial and industrial lighting business. Figures for the individual companies are given in the accompanying table, a study of which will show the marked improvement in annual load factor of some companies resulting from load-building activities in the past.

Electrifying existing industry

Of the major industries on the Pacific Coast, lumber and oil are the only two that are not completely motorized. Great strides have been made in the electrification of both during the past ten years. The large electrical manufacturers are largely responsible for converting sawmills to electric drive, while in the oil fields much of the credit is due the power companies for pointing the way.

Steam requirements of dry kilns, lifts, carriages, etc., in sawmills is such that mills find it most economical to generate their own power unless there can be found some way of converting their great quantities of mill refuse into revenue. In cases where mills can dispose of their excess power to public utliities they can afford to install generating capacity sufficient to utilize all refuse and operate their plants at good load factor.

The most outstanding development in sawmill electrification is the use of synchronous motors on difficult drives. In one of the latest mills to be placed in operation approximately 50 per cent of a total motor load of 22,000 hp. is in synchronous motors. Such drives as "hogs" or refuse grinders, edgers and band mills are now capable of synchronous motor application. The hog is the most difficult of these, and because of extreme load fluctuations it is necessary that provision be made to open the field when the motor pulls out of step. After operating as an induction motor until the load has dropped, the field is again closed and the motor pulls into step. This happens frequently, but operation is quite satisfactory and indicates that few drives remain in any industry so difficult that synchronous motors cannot be used.

Pulp and paper is now one of the largest and most rapidly growing industries of the Northwest, but this load, like the sawmill, is beyond reach of the central station in most cases because of the great quantities of process steam required. All plants, however, are completely electrified as to motive power. Electric heating of drier rolls, because of uniformity of temperature control, will likely be the next important step in complete electrification of this great industry.

The oil industry of California is one of the oldest industries of the Pacific Coast, but is probably less electrified than any other. All new electrical pumping or drilling applications in the oil fields, however, represent business for the central station, as the oil companies purchase all their power. Both the Southern California Edison Company, Ltd., and the San Joaquin Light & Power Corporation have done splendid work in electrifying the oil fields and have both derived great benefit. All new wells are electrically pumped, and of existing wells it is safe to say that 40 per cent are now being pumped electrically. So economical and satisfactory has electric pumping proved that oil producers use motor drive even though they have natural gas available that costs them nothing. The trend in well pumping is toward the use of 5- to 15-hp., high-speed squirrel-cage motors driving the pump through unit reduction gears. These installations, in conjunction with portable pulling rigs, are displacing the double rated pumping and pulling motor and are so much less in first cost that a new field has been opened for electric pumping.

During the past two years the Southern California Edison Company, Ltd., has aided in selling more than

500 such installations. This company now serves an oil field load of 236,000 hp. Of this 47,334 hp. was added in 1928, 64,287 hp. in 1929, and it expects to add 60,000 hp. during 1930. The San Joaquin Light & Power Corporation has a connected oil field load of 56,284 hp. and 50 per cent of the wells in the territory it serves are pumped electrically.

Industrial heating promises great future

The whole West Coast is developing industrially and in the field of industrial heating lies the power companies' greatest opportunity for new business. On the Pacific Coast only one power company, the Southern California Edison Company, Ltd., has done a really good job in developing this high load factor and profitable business. With one or two exceptions other utilities either have gas as well as electricity to sell or have failed to organize properly and go after industrial heating. It is true that southern California has been favored with a rapid industrial development during the past ten years, but industrial heating would have gone to gas if the power company and electrical manufacturers had not been alert.

At the close of 1926 the Edison company served a total of 19,000 hp. in industrial heating load. This was mostly in arc furnaces. During 1927 an industrial heating salesman was employed and during that year a comprehensive survey was made and 1,000 hp. of new business added. Three men secured 11,000 hp. more in 1928, and in 1929 four men added 17,000 hp. There are now five men working exclusively on industrial heating and another 17,000 hp. of new business is expected by the end of this year. Thus, in the brief period of three years, 29,000 hp. of industrial heating load was added to the lines of this one company alone, an increase of 153 per cent, and all of this, too, in competition with 1,100-B.t.u. natural gas costing the customer on the average 20 cents per thousand cubic feet. The average rate paid by industrial electric heating consumers is about 1.2 cents per kilowatt-hour.

Sales resistance is being broken down by numerous highly satisfactory installations and new applications are constantly developing. One new application, if proved out commercially, will mean an immense load in southern California. A new petroleum cracking process has been developed which will require 3,000 kw. of electric heat per unit. The first commercial installation is now being designed, and if it proves out satisfactorily 100 similar installations are assured. This would mean an industrial heating load of 300,000 kw.

Intensive sales effort to market natural gas in California, as a result of passage of a conservation law in 1929, will mean stiff competition for the electric utility in the future. One of the first effects will be felt in the field of industrial heating. Electricity cannot hope to displace gas in raw heat processes just at present, but where uniformity of temperature control, quality of product, absence of products of combustion and reduction in scale and rejects are factors, electric heat will not feel the gas competition so keenly.

By far the most serious aspect of the gas situation is the consideration being given by groups of large industries to the formation of mutual companies, outside the jurisdiction of the regulatory commission, for the generation of their own power in centrally located steam plants burning natural gas. When a group of industries can think in terms of a 50,000-kw. plant and when the advantages that such a plant would have are considered, particularly where the plant could supply process steam as well as electric energy, it deserves some serious thinking, indeed, on the part of central station companies.

Plant investment, cost of gas and operating costs would be higher than for the central station, but the central station must step up its generator voltage for transmission, step down for distribution and in most cases make a third transformation to motor voltage. The mutual plant can distribute at generator voltage over its limited area and need only transform once at the most to motor voltage. The cost of money for the mutual plant would be higher, but the central station must make a return of approximately 8 per cent on its investment, and there are administration, engineering and other general expenses, which might be more for the central station than for the mutual plant.

As against these possible advantages must be weighed the fact that the industrial group must split its plant capacity up into several units as insurance against costly outages, and with several small units they could not possibly attain the high efficiency secured by the central station on its large-capacity, high-economy units. Moreover, the industrials are unable to take advantage of the higher diversity and load factor realized by the central station by reason of the large territory it serves and the great variety and types of load that go to make up its system characteristics. Also, the mutual plant must write off its investment in a period of 25 or 30 years or the prospective period of cheap gas supply, or else figure on an oil or coal base.

In any event, it is purely an economic problem, but it behooves central stations of the southwest, as well as in

TOTAL ENERGY SALES, INCREASE IN POWER BUSINESS AND LOAD FACTOR OF TYPICAL WEST COAST UTILITIES

	Total Energy Sales Thousands of Kw.-Hr.		Energy Sales After Deducting Domestic Consumption, Thousands of Kw.-Hr.		Per Cent Over 1922 Eliminating Domestic Business	— Load Factor —	
	1922	1929	1922	1929		1922	1929
Southern California Edison Company, Ltd.	901,874	2,591,000	854,901	2,385,800	179	57.2	63.2
Pacific Gas & Electric Company	1,098,123	1,948,656	1,014,993	1,672,215	65	62.5	..9
San Joaquin Light & Power Corporation	370,384	670,075	358,470	627,513	75	58.2	....
California Oregon Power Company	95,262	342,224	88,317	311,434	254*	....	49.5
Pacific Northwest Public Service Company	246,340	487,940	221,660	419,843	90	51.0	55.0
Puget Sound Power & Light Company	378,371	727,523	360,834	605,118	68	....	55.6
Pacific Power & Light Company	60,211	199,761	51,562	156,115	200	52.5	63.0
Montana Power Company	827,759	1,389,000	820,699	1,362,178	66	81.2	82.0
Utah Power & Light Company	351,692	752,828	334,159	707,152	112	59.8	70.7
	4,330,016	9,109,007	4,105,595	8,246,568	101	....	....

*Includes a large block of power wholesaled to another utility.

other sections where surplus natural gas is available, to prepare to meet the issue. Combination gas and electric utilities are not so much concerned, because they will get the business in either case, but the straight electric utilities would suffer an out and out loss of revenue.

Natural gas engines also, for individual industrial plants, must be taken into consideration. Already one pumping installation has been lost to natural gas engines, but the situation is not alarming. Natural gas engines are nearly as efficient in small sizes as they are in large units, but by the time added attendance and maintenance, cost of line shafting and power loss and the possibility of lengthy outages are taken into consideration the future of the gas engine is not so bright. Few industries are going to retrogress by going back to a maze of pulleys, belts and line shafting.

On the whole, the industrial outlook for the Pacific Coast is bright. Business is returning to normal and industrial development is proceeding in orderly fashion as population increases and as the markets of the West Coast and the Orient expand. Utilities of that section have always developed well in advance of needs and will continue to safeguard industrial power supply in the future and to carry on their aggressive campaigns to build an electrified industrial empire in the West.

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Electrical Statistics for California Farms

IN A bulletin (Circular 316) recently issued by the division of agricultural engineering of the University of California and the committee on statistics of the California Committee on the Relation of Electricity to Agriculture are to be found results of a comprehensive survey of electrical usage on California farms. The report is the work of a committee appointed to accumulate statistics for the year 1925 and a second committee to study returns and publish findings.

Three direct methods were used in making the field survey. A questionnaire was sent to all power companies, a postcard survey of farm appliances was made and information was secured from the California Railroad Commission.

The first section of this table reveals the fact that 186,560, or 89 per cent, of the total number of rural customers had electric lights; 13,650, or 6.5 per cent, used electricity for heating and cooking, and 48,460, or 23 per cent, used electricity for power. The second section of the table shows that rural customers classified as "agricultural" or farmers either automatically or by a study of each district by the local power company office comprise 51,000, or 24 per cent, of the total; that 49,800, or 97 per cent, of farms had electric lights; that 9,060, or 18 per cent, used electricity for heating and cooking, and that 40,330, or 79 per cent, used electric power.

The postcard survey consisted of mailing out through the power companies 50,000 postcards to their agricultural customers. Of this number 18 per cent were filled out and returned. The cards contained spaces for 57 answers on the number and size of appliances used, acreage and crops grown. A study of returns showed the necessity for a consistent method of extending data to cover the entire state. The ratio of cards mailed to returns was 5.4, but because the farmers most likely to fill in and return cards would be those favoring the use of electricity, the returns were multiplied by a smaller factor. A multiplying factor of 5 was used, based on the ratio of motors included in the power company survey to that obtained by the postcard survey and upon the connected loads secured in like manner. These ratios were 5.09 and 4.85, respectively. Table II gives statewide figures on the total number of appliances and motors with 5 used as a multiplier.

Table I—Summary of Electrical Statistics on California Rural and Farm Customers for 1925

Total rural* customers receiving service	†210,000
Total rural* customers receiving lights	186,560
Total rural* customers receiving heating and cooking	13,650
Total rural* customers receiving power	48,460
Total farms receiving central station service	†51,000
Total farms using electricity for lights	49,800
Total farms using electricity for heating and cooking	9,060
Total farms using electricity for motors	40,330
Total horsepower connected load, agricultural power only	635,916
Total kilowatt-hours consumed for agricultural power only	712,947,487
Total revenue—agricultural load only (power)	$11,010,694.15
Average connected load horsepower (power load)	15.77
Average annual consumption kilowatt-hours (power only)	17,678
Average annual revenue (power only)	$273.01
Average price per kilowatt-hour	$0.0155
Per cent of California farms receiving central station service	40

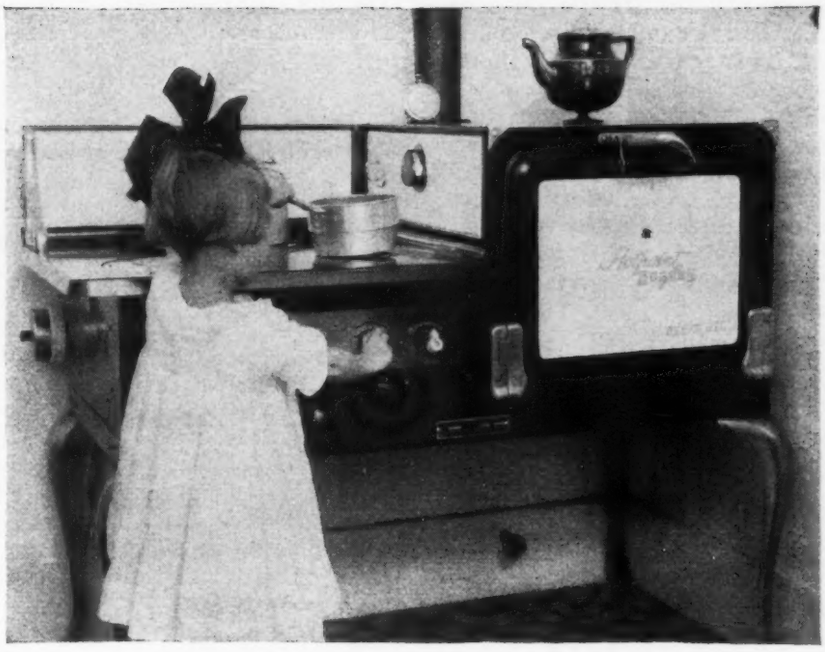
* Customers residing outside of incorporated towns or cities.

† Customers receiving more than one class of service have been counted as one customer for the purpose of the total.

Table II—Electrical Appliances and Motor-Driven Machines on California Farms in 1925

Figures Are Based on Postcard Survey

	Number of Items	Horsepower, Connected Load
Motors (all sizes not including domestic)	63,225	.....
Farms receiving central station service	51,000	.....
Lighting consumers	49,800	.....
Irrigation motors	39,600	656,000
Flatirons	34,800	.....
Washing machines	18,000	.....
Vacuum cleaners	17,800	.....
Toasters	17,000	.....
Domestic water supply motors	12,500	24,000
Curling irons	11,980	.....
Ranges	11,300	.....
Portable fans	10,000	.....
Percolators	9,200	.....
Space heaters	9,300	.....
Farms using electricity for cooking	9,060	.....
Water heaters (fixed type)	6,700	.....
Waffle irons	6,420	.....
Sewing machines	6,400	.....
Incubators	5,700	.....
Table grills	5,480	.....
Heating pads	5,320	.....
Battery chargers	5,130	.....
Bell transformers	4,980	.....
Brooders	4,400	.....
Cream separators	1,570	430
Shop motors	1,400	2,960
Milking machines	1,370	2,750
Feed grinders	1,280	5,400
Refrigerators	1,090	1,940
Immersion heaters (portable type)	1,060	.....
Ironing machines (mangles)	820	.....
Dehydrator fans	600	7,800
Wood saws	400	1,400
Dish washing machines	170	.....
Silo fillers	115	1,760



The next generation will cook electrically

How West Coast Developed Its Domestic Business

By WALTER C. HESTON

Pacific Coast Editor ELECTRICAL WORLD

HOW have power companies of the Pacific Coast achieved such remarkable results in the development of home service and what factors have contributed to the high revenue and consumption per customer which make them the object of close study? To commercial men of the West Coast it is an old story. To men from the East who attend the forthcoming N.E.L.A. convention in San Francisco the answer will be obvious once they familiarize themselves with past load-building activities. It will be found that promotional rates in effect over a long period of years, coupled with aggressive merchandising, with particular stress upon ranges and water heaters, have resulted in the high consumptions and revenues which obtain.

Why such stress has been laid upon domestic business by utilities on the west slope of the Rockies will be evident when the load-building problem of the territory is analyzed. Industrial development has been slow, but such industry as there is is almost 100 per cent electrified, leaving no potential market. There is practically no such thing as the isolated plant and power companies have had to depend almost entirely on new industries for increased load. Locating of new industries is dependent upon factors largely beyond control of the utilities, and they have had to take what came. Practically all homes within reach of service are wired, hence there is no home-wiring problem. Attention, therefore, was directed, and logically so, toward increasing consumption of existing domestic customers.

Promotional rates

The first step was the establishment of promotional or inducement rates. The first of these were established back in 1917, when the possibilities of the electric range were beginning to be seen. Most all rates are block rates, with all domestic service on one meter with the exception of water heating. About half of the larger companies have a separate rate for water heating and the other half combine water heating with all domestic use. The range block is from 3½ cents downward, with a 1-cent rate in one case. The average range rate for the territory as a whole is between 2½ and 3 cents. This has proved sufficiently low to develop a large volume of business in competition with the low-priced fuels obtainable.

A number of companies feel that it is best to make a separate rate for water heating rather than provide a low block at a cent or a cent and a half. One large Northwest company has a one-meter rate for all service

with a water-heating block of 1½ cents. Some companies in this territory hold that it is unwise to set up such a rate, since it means that all future increased consumption will fall in the 1½-cent block and they cannot afford to sell service for all domestic use at this rate. Others, however, feel that once fixed charges are taken care of by the higher steps in a rate, it costs no more to deliver a kilowatt-hour to a domestic customer than it does to any other class of customer. Strange as it may seem, this company with the single meter rate has the highest average annual revenue and second highest average consumption per customer of any company on the Coast.

Any company can duplicate the remarkable showing made by utilities of the Pacific Coast, first by establishing inducement rates and, second, by starting a determined campaign to sell ranges, water heaters and other load-building appliances.

To what extent promotional rates are responsible for high consumption and revenue and to what extent active appliance selling has been a factor are almost impossible of analysis. It is certain, however, that the two are so dependent one upon the other that low rates in themselves will not build load rapidly, nor will the most aggressive merchandising do the job unless the rate is right.

Results of an inducement rate and active load building are well illustrated by the accompanying curve, which shows average revenue, average consumption, average rate and range saturation for the domestic business of the Pacific Northwest Public Service Company (formerly Portland Electric Power Company). For twelve years this company has had range and water heating rates and has been doing a good load-building job. It will be seen that over this period revenue has increased from $16.66 to $31.60; consumption from 245 to 945 kw.-hr.; the rate has dropped from 6.8 cents per kilowatt-hour to 3.35 cents and range saturation has increased from nothing to 16.4 per cent. Other companies show greater revenue, consumption and range saturation, but their records are not available to show results over a period of years.

Range of business is profitable

Following establishment of inducement rates, the second step was to get behind the electric range. Sales effort has been so intensive and electric cooking so popular that fifteen major utilities on the Coast now serve 185,159 ranges and new range customers are being added at the rate of 40,000 a year. The highest saturation is 42 per cent in the case of the Idaho Power Company, and the weighted average for the fourteen companies is 12.3 per cent. These figures are based upon a total of 1,500,619 residence meters. The table on page 1168 gives individual figures for each company.

During the past two years practically every apartment house in the city of Seattle costing more than $20,000 has been equipped with electric ranges. For five years it is claimed that 90 per cent of all new homes built in Portland have been wired for electric ranges.

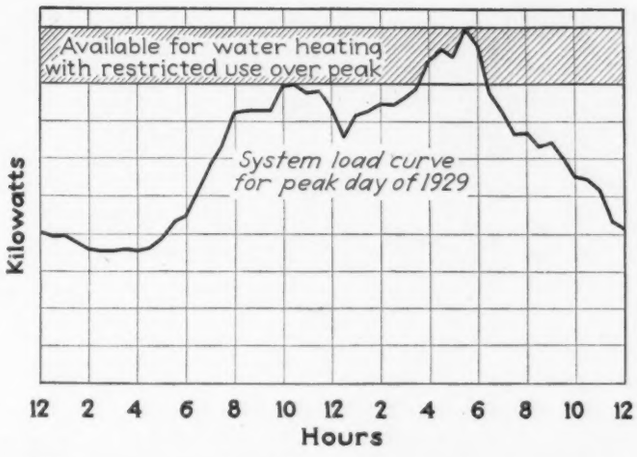
Companies that pioneered the electric range were not certain for a number of years whether the business paid at the rates they had established or not. One company answered this question for itself as well as for others when it made a detailed cost analysis in 1925. At the close of 1925, this company had 6,937 range accounts on its books which showed a consumption for the year of 11,170,498 kw.-hr., bringing a gross revenue of $334,179.29, or an average return of 2.97 cents per kilowatt-hour. The direct expenses for selling approximately 2,000 ranges during the year were $71,039.88. Indirect expenses applicable to the range business were found to be approximately $197,667.90. This left a net income of $134,511.39. In a previous analysis an investment of $340 was found necessary to supply a range customer. On that basis 6,937 range customers would involve an investment of $2,358,580. On this investment a net income of $134,511.39 gives a return of 5.7 per cent.

Every item of expense, including new-business expense, was charged against the range business, but it did not seem proper to include new-business expense, since if the company had stopped soliciting, its existing business would have gone on just the same. If the new-business item is eliminated the net income would be increased to an amount which would make the net return 7.8 per cent. In this analysis calculations of investment costs were made on the basis of a demand of 1 kw. per range at the power plant, or an average demand of approximately 0.6 kw. at the customer's meter after allowing for all losses. This figure of 0.6 kw. checks reasonably close with results found in the N.E.L.A. range survey. The company making the analysis sold 2,200 ranges during 1925 and had a range saturation of something over 7.5 per cent. Results may be taken as fairly representative of what can be expected in the way of return with this saturation under this rate.

On the Pacific Coast the electric range has received public acceptance, but it does not follow that ranges will sell in satisfactory volume without continued selling effort. Those companies that are thoroughly sold on the desirability of the range load and have the greatest range saturation are the ones that are putting forth the most

The 5,000 Kw.-Hr. Mark Is Within Reach

Use	Kw.-Hr. Per Year
Lights and small appliances	600
Electric ranges, 50 per cent saturation	750
Water heating, 50 per cent saturation	3,000
Refrigeration, 50 per cent saturation	300
Radio, 50 per cent saturation	125
Electric heating, sun lamps, etc	225
Total kilowatt-hours per year	5,000


Available for water heating with restricted use over peak
System load curve for peak day of 1929
Kilowatts
12 2 4 6 8 10 12 2 4 6 8 10 12
Hours

Why not turn this block of surplus power into water-heating load by limiting service over annual peak?

intensive effort to increase their business. The only method found successful in selling ranges is to set about the job with determination. Back of every case where a good selling job has been done will be found a well-organized selling plan and a determination to get results. It is necessary to "force feed" range sales, otherwise only the surface will be skimmed and only those who are in a position to buy luxuries will purchase ranges.

Any company intending to build a range load is interested in knowing how many salesmen are required and what it costs to sell a range. A check of a number of companies selling a large number of ranges indicates that on the average about seven men are required to sell 1,000 ranges in a year. The cost of selling a range varies from 20 per cent of the retail price to about 40 per cent, depending upon the sales effort put forth and the number of ranges sold. Typical costs of selling 1,000 ranges based on an average cost of $115 per range to the power company are:

Item	Cost per Range
Uncrating, setting up and testing	$5.00
Advertising	5.00
Direct sales expense (commission and salary)	16.00
Overhead (stores expense, sales supervision, commercial expense, etc.)	9.00
Installation (cartage, labor and material connecting)	7.50
Demonstration after installation	4.00
Total sales expense	46.50
Cost of range	115.00
Total cost	$161.50

The manufacturer's list price on a range costing $115 is about $160, so that at list price and the above costs the power company can just about break even on the sale of ranges. However, where it was found necessary to sell at cost or cost plus 25 per cent, in order to popularize electric cooking, the companies working on this basis felt justified in spending the first year's revenue of about $40 to get the business.

Considerable data are now available on servicing costs from several Pacific Coast power companies that have kept accurate records over a period of years. The experience of all companies has been that servicing costs have steadily declined from year to year as saturation increases and as the manufacturers' product is improved. One company keeping detailed costs found that the average cost of servicing a range in 1920 was $7.88, while for 1929 it was only $2.37. The average cost for all companies on the Coast is now well under $4 per range per year.

In a few instances free service is given indefinitely, but in most cases a charge is made for material at cost after the first year. One or two companies make a charge for both labor and material after the first year.

Hand in hand with the range business has gone the development of water heating. Potentialities of the water-heating load have long been recognized, but there has been such a paucity of information on the subject and such a divergence of opinion as to types of heaters and rates that water heating has not yet come into its own. A number of central stations, particularly those in California, have favored the high capacity (3- to 5-kw.) intermittent type heater on their regular one-meter domestic schedule. On the other hand, companies in the Northwest started out with low-wattage heaters running continuously or on double-throw switch against equivalent capacity in the range, usually the oven. This service for the most part was flat rate, and is still on several properties, but the tendency is to get away from the low flat rates which have prevailed.

Gas competition does not prevent range sales. Fifteen central stations of the Pacific Coast serve 185,000 electric ranges. Of these, 24,450 were sold in the face of cheap natural gas competition and 28,650 against the most active artificial gas competition to be found anywhere in the country. In these same territories new range customers are being added at the rate of 15,000 a year.

From all the discussion and experimenting with water heating there have emerged ideas and several systems which seem to be sound. They provide satisfactory service to the customer at a price he can afford to pay, a prerequisite of any system, and they bring the power company a good return as well. One such system is that adopted by the Utah Power & Light Company. This installation consists of two clamp-on type heaters, one about one-third of the way down from the top of the tank and the other about a fourth of the way up from the bottom.

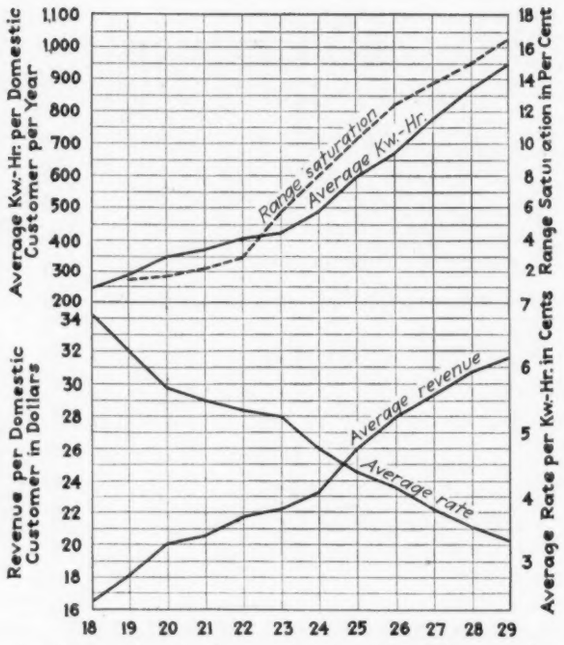
The top heater runs continuously on thermostatic control, providing a third of a tank of hot water at all times. When a greater quantity of hot water is desired the bottom heater is turned on manually and allowed to run as long as necessary. The standard installation for a 30- and 40-gal. tank consists of two 1,000-watt heaters placed in recesses cut in a 2½-in. insulating covering.

These installations have the advantage of uniformity; they are easily made, and the first cost for a 30-gal. tank is only $60, including wiring. A one-meter rate applies

on the following schedule: First four active rooms, $1.25 per month; each additional room, $0.20 per month, plus an energy charge of 2½ cents for the first 300 kw.-hr., and 1½ cents for all additional consumption. With a load factor of approximately 80 per cent and a good return on its investment, the company feels that water heating under this set-up is good business and has sold more than 1,000 installations during the past year. Its quota for 1930 is 2,035.

As a result of many years of experience with different water heating systems and a careful study of the problem the Puget Sound Power & Light Company is convinced that it can sell a 300,000-kw. block of power for water heating without increasing its peak or its investment. A study of its system annual load curve shows that the peak would project into this 30,000-kw. block for only four months in the year. The effect of this is illustrated by the accompanying curve for one day during November, 1929.

The company is seriously considering a water-heating system which would operate with a time clock during three or four months of the year to prevent the water-heating load from coming on the system peak. Such a system would require greater water storage than with unlimited service, but this could be solved by using 40- to 60-gal. tanks instead of the customary 30- or 40-gal. size, and applying a 1,500-watt heater. Heaters would be thermostatically controlled, and with a diversity even as low as two to one 40,000 water heating customers could be served. This would give a saturation of 29 per cent. Water heating would be separately metered and a rate established that would rapidly develop the business.


Average Kw.-Hr. per Domestic Customer per Year
Range saturation
Average Kw.-Hr.
Range Saturation in Per Cent
Revenue per Domestic Customer in Dollars
Average revenue
Average rate
Average Rate per Kw.-Hr. in Cents

A determined domestic load-building sales program will duplicate these results on any system

Water heating, without doubt, offers a large market for domestic sales and it seems certain that such systems as those just described, or others that take into consideration the fundamental requirements of the problem, will develop this great reservoir of potential business.

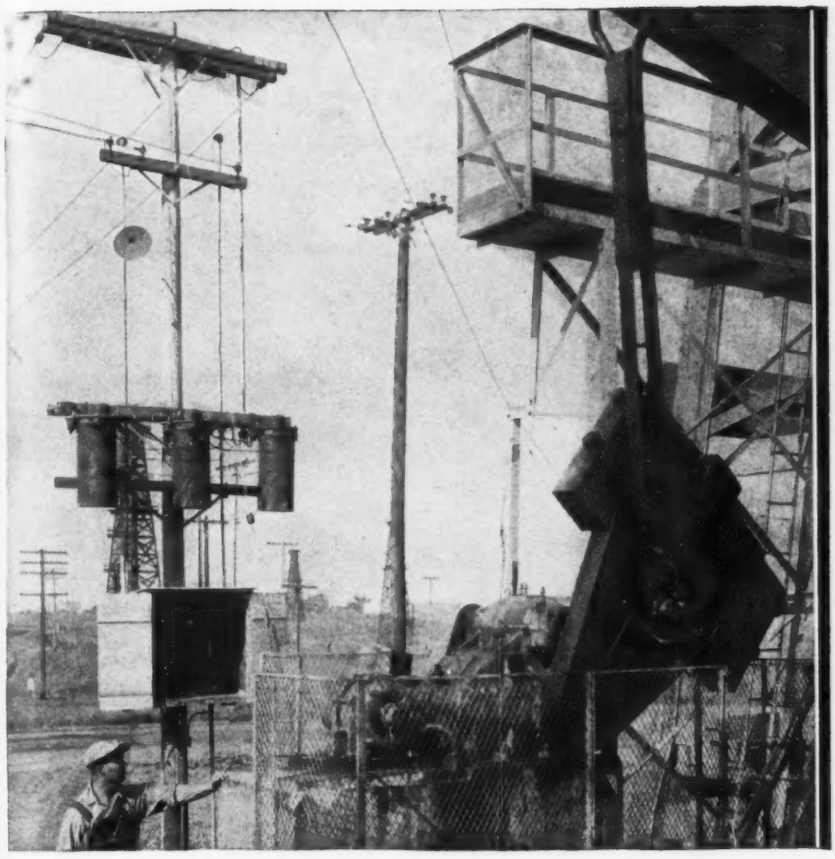
The future for domestic business is indeed bright. With electric cooking and water heating well established, with electric refrigeration rapidly increasing and with house heating in favorable climates and the many present miscellaneous uses and those to come, central stations of the Pacific Coast are looking for the same rapid rate of growth during the next decade as has been experienced during the past ten years.

Domestic consumption of 5,000 kw.-hr.

Many of the companies are looking forward to an average consumption of 5,000 kw.-hr. per customer by 1940. That such a consumption is entirely possible and that commercial men of the Pacific Coast are not visionary is illustrated by the table on page 1166, which gives a breakdown of the 5,000 kw.-hr. into the several major uses. This is not the goal, simply the next milestone to be passed in complete electrification of the home.

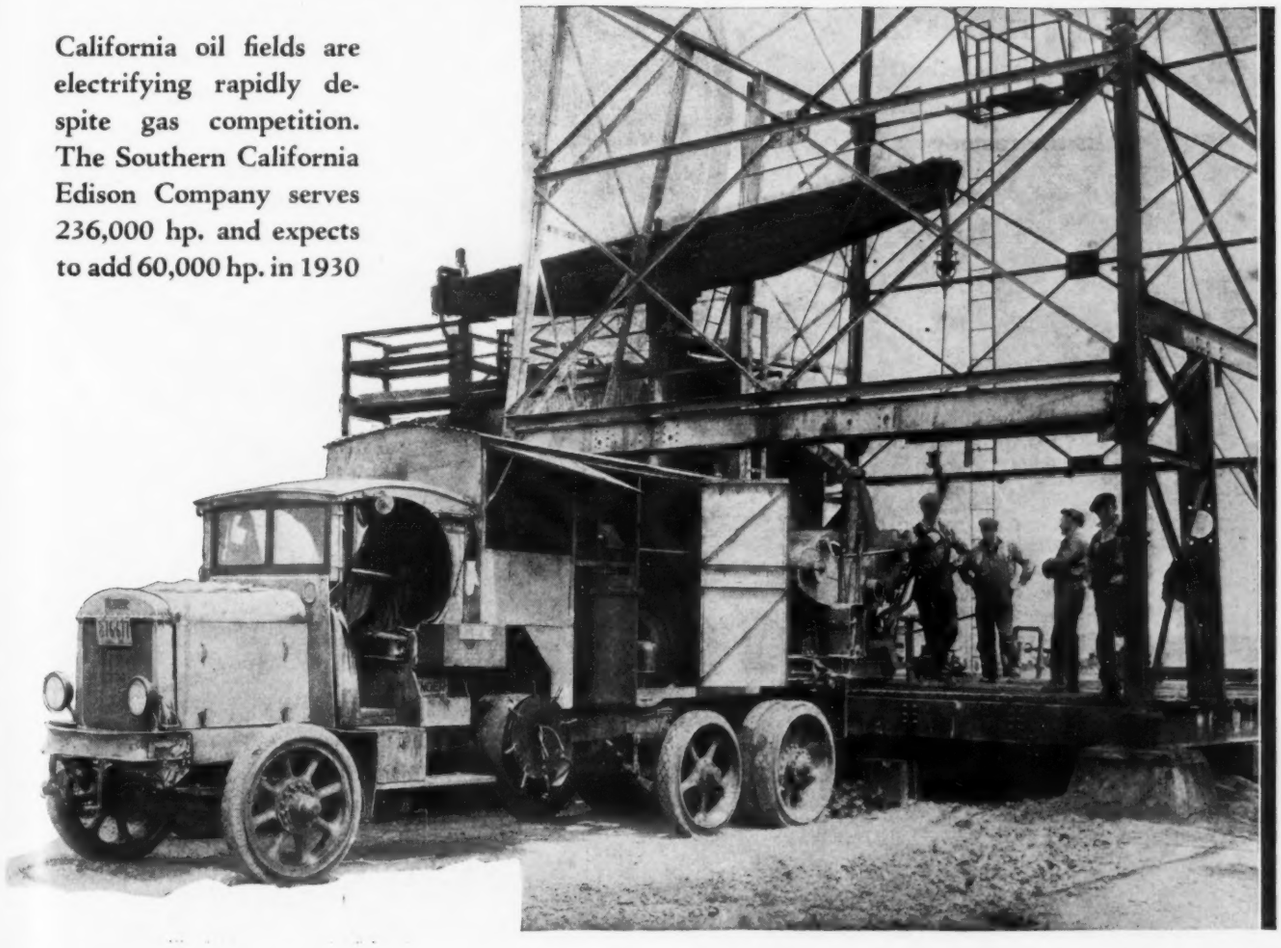
PACIFIC COAST COMPANIES SHOW BENEFITS OF INDUCEMENT RATES

	Domestic Customers	Domestic Kw.-Hr.	Average Kw.-Hr. per Customer	Average Revenue	Number Ranges Served	Range Saturation, per Cent	1922 Kw.-Hr. per Customer and Seven-Year Increase	
							Kw.-Hr.	Per Cent Increase
California Oregon Power Company	15,227	30,789,000	2,022	38.66	4,691	30.0	867	133
Washington Water Power Company	43,300	77,911,000	1,795	38.46	9,775	23.0	463	290
Idaho Power Company	28,909	36,187,000	1,252	46.88	12,311	42.0	...	...
Northwestern Electric Company	23,454	25,161,000	1,073	32.98	7,902	33.7	...	...
Pacific Power & Light Company	43,789	43,646,000	997	35.37	6,875	15.5	338	195
Puget Sound Power & Light Company	116,165	122,405,000	954	35.02	36,000	31.0	401	138
Pacific Northwest Public Service Company (formerly Portland Electric Power Company)	89,762	79,097,000	945	31.60	14,741	16.4	407	132
Great Western Power Company	43,895	37,645,000	872	35.11	8,486	19.3	...	...
San Joaquin Light & Power Corporation	54,833	42,562,000	835	37.16	7,137	13.0	364	129
Mountain States Power Company	35,700	24,926,000	693	30.26	.....	.....	...	...
Pacific Gas & Electric Company	446,362	276,441,000	619	30.83	25,000	5.6	342	81
Southern Sierras Power Company	19,193	11,978,000	602	37.06	2,697	16.5	...	...
Southern California Edison Company	362,815	206,000,000	587	27.40	21,472	6.0	332	75
Utah Power & Light Company	80,625	45,676,000	566	31.55	18,000	21.0	298	90
San Diego Cons. Gas & Electric Company	54,873	27,410,000	500	27.13	.....	.....	...	...
	1,500,619	1,114,656,000	743 (weighted)		185,159	12.3 (weighted)	...	...



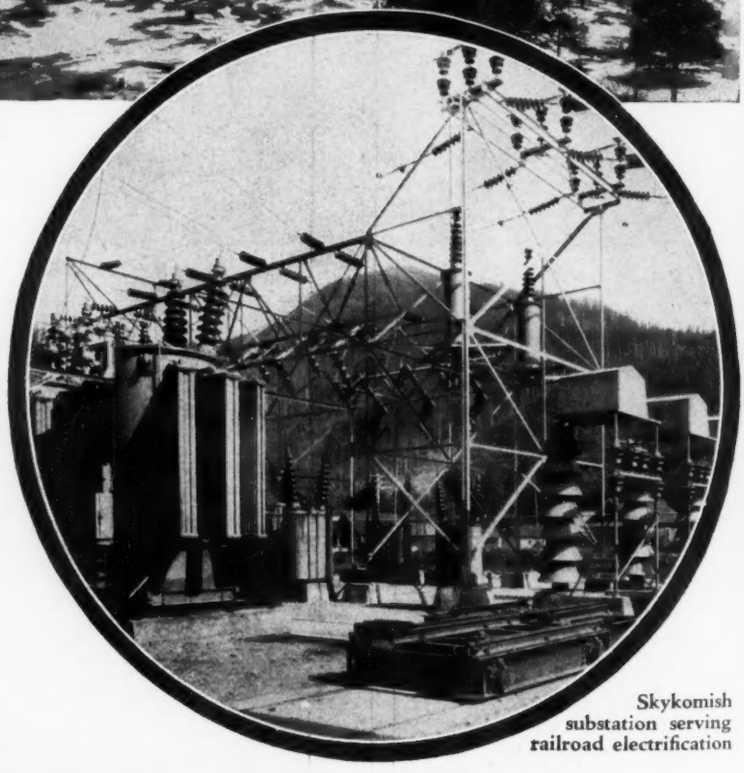
Three Big Loads

California oil fields are electrifying rapidly despite gas competition. The Southern California Edison Company serves 236,000 hp. and expects to add 60,000 hp. in 1930



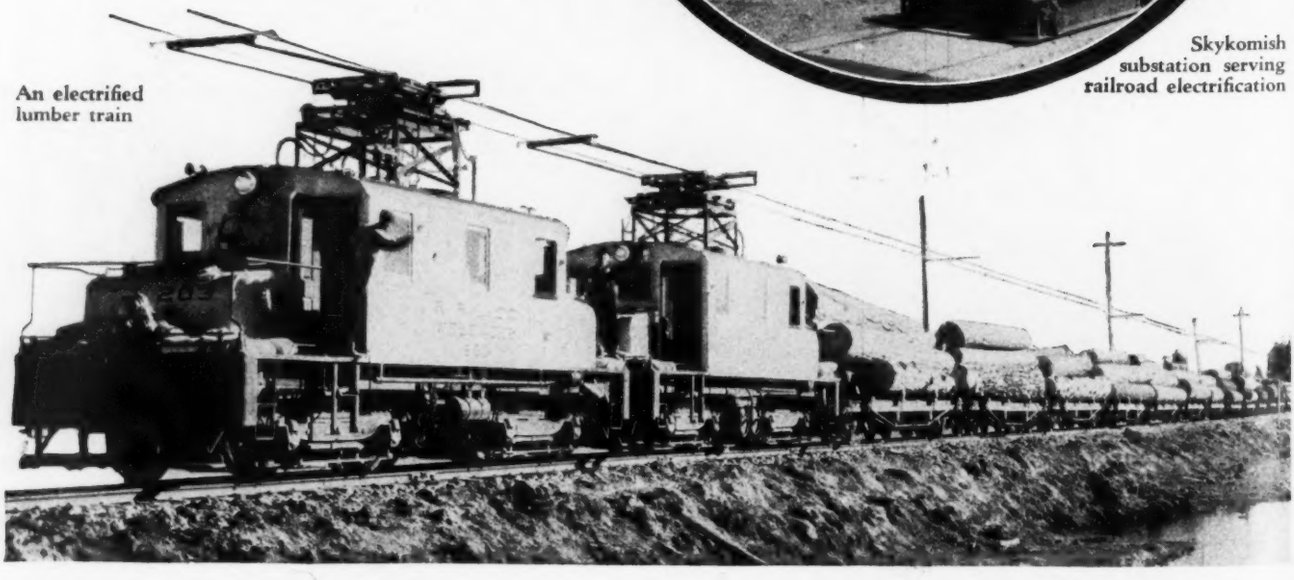
Great Northern freight train in Cascade Range

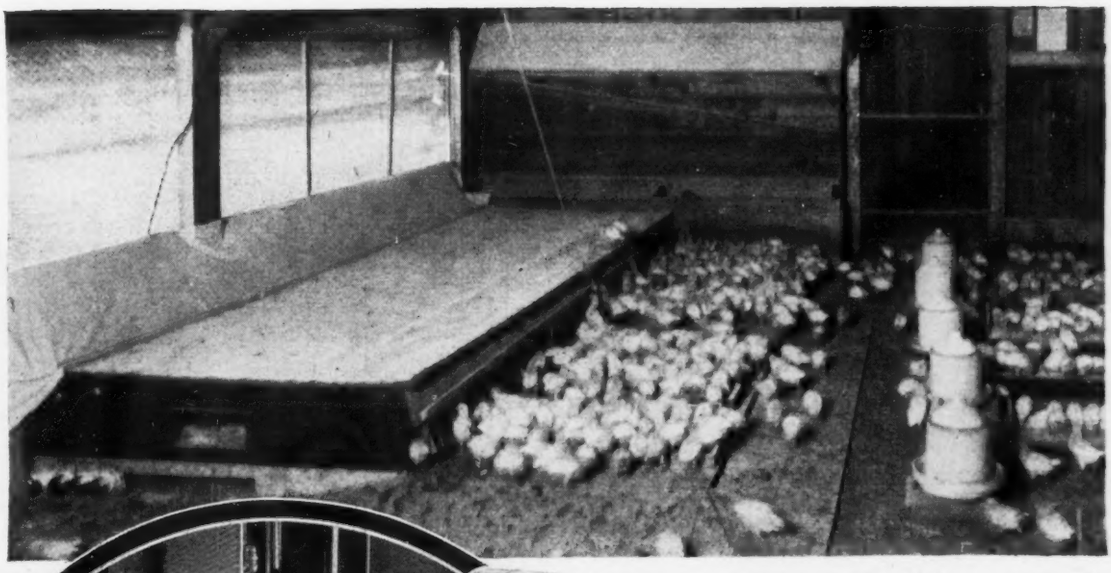
Western railroads must cross the mountains to reach the East. Mountain grades are the bottleneck and electrification is the remedy



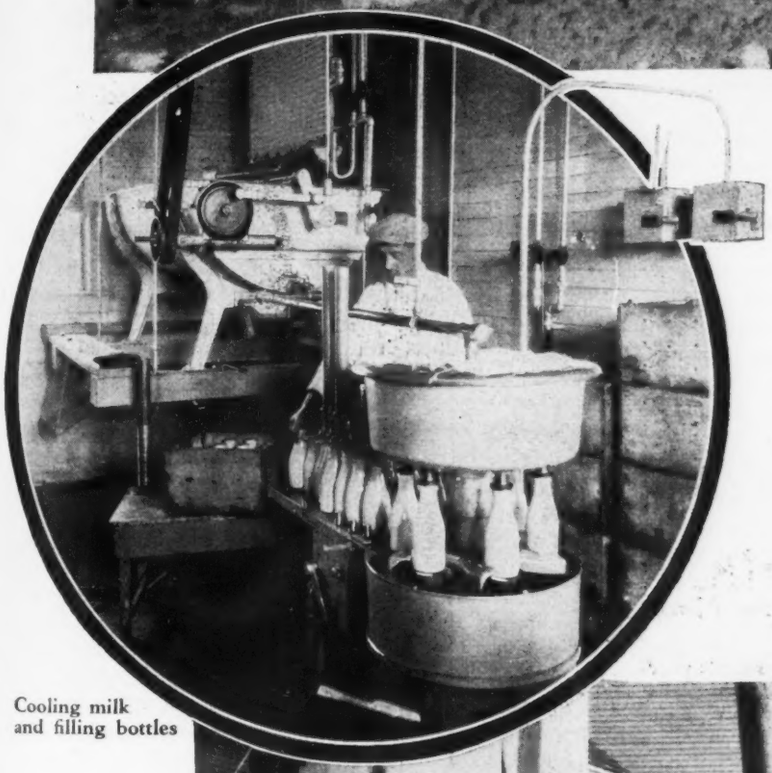
Skykomish substation serving railroad electrification

An electrified lumber train





Portion of 1,000-chick electric brooder



Cooling milk and filling bottles

California has 210,000 rural customers receiving electric service. They use 712,000,000 kw.-hr. and produce a revenue of $11,000,000

Filling the silo with motor-driven blower

REGULATION—
A Cross-Section of Opinion

Leaders of industry, utility executives, professors, commissioners express opinions on fundamental concepts of utility regulation

By A. E. KNOWLTON
Associate Editor ELECTRICAL WORLD

EVERY ONE knows what utility regulation means. That is, until you press for an exposition of the individual's conception of its full meaning. Then the answers vary. At least the literature on the subject, accelerated in its production by the recent sentiment toward scrutiny of the whole regulatory practice, reveals little in the nature of a common core for the varying theories. In the hope of bringing these variants into sharp contrast and that the common denominator might be disclosed through the medium of a statistical set-up, a questionnaire, the prevailing American method of imposing on business good nature, was prepared. It went out to all the utility commissioners, all the governors, many mayors, a selected list of business executives, most of the professors of economics, law and engineering who have been close to the problem, and finally to a short list of electric light and power leaders. Now let us see whether they are thinking in parallel channels.* First they were asked:

> Which of the following characterizations best represents your conception of the purpose and manner of functioning of a public utilities commission:
>
> (a) Formal referee court adhering to the rules of evidence and basing decisions primarily on legal precedent, secondarily on economic considerations.
>
> (b) Quasi-judicial agency combining the functions of investigator, prosecutor, defender of the public interest, and court.
>
> (c) Fact-finding administrative tribunal; averting formal disputes by informal treatment of incipient dissatisfactions; basing rate decisions primarily on economic data with due regard to constitutional limitations.

The replies:

	Formal Court	Quasi-Judicial	Economic Tribunal
Commissioners	1	14	13
Governors and mayors	0	2	6
Business men	0	0	6
Professors	0	7	6
Utility executives	0	3	8

The commissioners are divided; many are lawyers with a fondness for the legal, but not so much as to prefer the rigidity of court procedure for regulatory boards. The business men and utility men seem to lean strongly to emphasis on the economic factors. On the whole, it appears that the public desire for speedier decisions, less obscurance because of legal technicalities, more prominence of the dollar motive, is also the trend of thinking of those groups most intimately involved in the regulation machinery.

The powers delegated to the commissions by the several legislatures also vary rather widely, but in general the opinions expressed seem to be that, in the order of their importance, the indispensable powers relate to (1) rates, (2) standardized accounting, (3) making appraisals and valuations, (4) requirement of certificates of convenience and necessity, (5) prescription of standards of service, (6) the authority to initiate rate investigations, (7) authorization of new security issues. Items that are secondary but important prove to be (8) standards of safety to employees, consumers and users of the highway, (9) the power to set aside contract rates between utilities and also between them and their large customers when "against the public interest," (10) jurisdiction over municipal plants, (11) approval of mergers and changes in ownership, (12) stipulation of the details of capital structure, i.e. balance of bonds, senior and junior securities. The minor powers seem to be (13) issuance of construction permits for electrical transmission lines and (14) requirements for joint use of pole, wire and conduit facilities.

The various groups approached show about the same division of opinion on these points except in connection with the last three items classed as minor. Utility executives are all for regulation of municipal light and power enterprises, while the commissions seem to be content with the burden of regulating the private corporations. On the matter of construction permits, the utilities are unanimous in calling it a minor function, whereas the commissioners are less certain that it is not at least of secondary importance. Several comments suggested that some other state agency could well relieve the commission of this technical responsibility. Similar comments were made about the matter of safety to employees and consumers.

Commission administration

So much for the elements involved in the functional concepts and the powers delegated to carry them out. Another group of questions was framed to bring out the reaction of those elements which have been the origin

of most of the latent unrest about the efficacy of regulation as a practical administrative proposition. Are the commissions properly constituted and adequately compensated; has the intrusion of the holding company, with its chain-store philosophy, hampered the regulation of the purely operating companies; to what extent is federal regulation necessary or imminent; have the court rulings obscured the issues and imposed legal embarrassments to solutions which are predominantly economic in character? Thus:

With respect to the personnel, do you believe the members of the commissions should
(a) Be appointed?
(b) Be elected?
(c) Meet qualifications of economic, legal or engineering nature?
(d) Receive salaries that are compensatory or nominal?

	Appointed	Elected	Salaries: Qualifications	Salaries: Compensatory	Salaries: Nominal
Commissioners	20	9	21	27	0
Governors and mayors	7	1	8	7	1
Business men	4	1	5	5	1
Professors	11	1	10	12	0
Utility executives	12	0	10	11	0

The commissioners from states where they are elected prefer this procedure and those who are appointees have little disposition to subject their candidacies to the distorted emphasis on issues which attends a bid for favor with the electorate. The aggressive West, in contrast to the conservative East, is also an explanation of the division of opinion on the route by which commissioners arrive in office. The utility men are supported generously by the other groups in the strong preference for the appointive procedure. Only two of the commissioners took the pains to emphasize their aversion to meeting prescribed qualifications by recording a positive "no." The rest subscribed to the idea that it is well for a commissioner to be more than merely ambitious to do justice to an important task. The college authorities, if they are engineers, advocate an engineering qualification for at least one member of the board; the economists are not so insistent on the engineer representation; the law school deans and professors are lukewarm about any qualifications, apparently content with the predominance of lawyers on the present boards.

On the matter of compensation, it is not strange that the commissioners show little disposition to relinquish their present partly compensatory salaries for a mere nominal stipend. In fact, there is throughout all groups a vigorous agreement on the proposition that utility regulation presents one of the most baffling complications in our governmental-business appositions at the present time and calls for a high caliber of incumbent with compensation commensurate with the responsibilities and a proper command of public respect.

Holding company regulation

In the public estimation the entrance of the holding company has done more to create an inquiring state of mind than any one other factor. Do the commissions and other groups feel that their problem has been rendered insoluble by the injection of this same factor in the utility field that is the order of the day in unregulated business as well?

Is it your opinion that the powers of the commissions need to be enlarged to meet the situation created by the entrance of the holding company?

	Need Enlarged Powers Over Operating Companies? Yes	No
Commissioners	21	4
Governors and mayors	4	3
Business men	2	4
Professors	12	1
Utilities	1	10
	40	22

The commissioners want extended authority over operating companies to bring the relations with holding companies within their purview and the academically minded are still stronger for it. Power and light officials cannot see the need.

"I do not believe that the powers of commissions need changing on account of holding companies. Holding companies will, in my opinion, never be regulated. The ease with which they can be created puts them beyond regulation.

"A holding company should not be allowed to exist. Congressional action and state legislative action should be taken to abolish them."—COMMISSIONER J. H. MILLER, *Nebraska.*

Coming to outright regulation of the holding companies, we see less enthusiasm for it and more against it than for the idea that a mere extension of powers over operating companies is called for in the present circumstances.

Do you think that the commissions should be empowered to regulate the holding companies?

	Regulate the Holding Companies? Yes	No
Commissioners	19	4
Governors and mayors	5	2
Business men	2	4
Professors	11	2
Utility officials	0	12
	37	24

*Cross-Section of Opinions on Regulation

Replies were received from the following: Members of state commissions of Alabama, Arizona, Arkansas, District of Columbia (3), Georgia (2), Indiana, Iowa, Kansas, Maine, Maryland (3), Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Utah (2), West Virginia, Wyoming; Governor Cooper of Ohio and Governor Dern of Utah; mayors or municipal officials of Cincinnati, Denver, Louisville, Pittsfield, St. Louis and Trenton; Walter R. Avery, L. C. Belnap (Worthington Pump & Machinery Company), H. W. George (Metropolitan Life Insurance Company), George Satterthwaite (Henry Disston & Sons), H. S. Spurr *(Public Utilities Fortnightly)*, J. F. Strough (Timken Roller Bearing Company), J. W. Van Dyke (Atlantic Refining Company); Profs. T. W. Adams, A. L. Bishop, C. E. Clark, W. M. Daniells, C. F. Scott (all of Yale), J. C. Bonbright, R. L. Hale (both of Columbia), C. O. Ruggles, R. W. Taussig (both of Harvard), W. E. Mosher (Syracuse), G. C. Shaad (Kansas), O. J. Ferguson (Nebraska), L. E. Reukema (California), and utility executives P. S. Arkwright, R. H. Ballard, D. C. Barnes, J. E. Davidson, R. T. Griffiths, A. F. Hockenbeamer, E. W. Lloyd, A. C. Marshall, J. F. Owens, R. F. Pack, Paul A. Schoellkopf, M. S. Sloan.

Three of the commissioners might advocate the regulation of holding companies, but they confess they do not see how it can be effected. Business leaders join the utility group in opposing it, presumably on the ground of an unwarranted intrusion into private investment prerogatives.

"The Maryland Commission feels that it is vital to the proper regulation of companies owned and managed by holding companies to be able to find out the basis for every charge made to the held company, to learn the character of services for which charges are made by the holding company, and to have before it any contracts, either for management or construction, by the holding company and its subsidiary or subsidiaries in this state. Maryland, of course, is not interested in the relations between the holding company and its subsidiaries in any other state, and does not wish to inquire into such relations."—CHAIRMAN HAROLD E. WEST, *Maryland Commission.*

Congress has been importuned by some of its members to become excited over the extent to which interstate transactions and transmissions of power have vitiated the control of state commissions and thereby made federal regulation an alluring venture. Three questions were asked to bring out the sentiment on these items.

> Do you feel that the magnitude of interstate transactions and operations is great enough materially to limit the effective functioning of the commissions in regulating rates?
>
> Can some workable and constitutionally permissible scheme of interstate compacts be evolved to handle interstate ramifications of the regulation problem?
>
> Do you feel that the situation with respect to the electrical industry makes some degree of federal regulation necessary?

Interstate regulation

The utility men are of one mind that across-the-line operations do not prevent adequate regulation of interstate rates and service. The commissioners, governors and mayors are not agreed, but inclined to believe, that the problem is minor and can be met by application of present delegated powers. The academics, advance guard of public opinion, often far in advance, are disturbed by the trend toward regional unification of the lectric systems. The business executives are not alarmed and see no need for extension of commission powers. Thus:

	Do Interstate Operations Hamper State Regulation?	
	They Do	They Don't
Commissioners	6	17
Governors and mayors	4	4
Business men	1	5
Professors	8	4
Utilities	0	12
	19	42

"Up to this time the amount of electric current crossing state lines is very small, and we have not had the slightest trouble handling the situation so far as interstate movement of current is concerned."—PRESIDENT C. W. MCDONNELL, *North Dakota Commission.*

"Not at present but it will be."—PROF. W. E. MOSHER, *Syracuse University.*

Compacts between the states have been suggested as a means of adding the access to interstate facts to the intrastate data now available to the commission. The commissions are very hopeful that this could be accomplished and so are the governors and utilities. The others are not so sure.

	Are Interstate Compacts Feasible?	
	Yes	No.
Commissioners	18	3
Governors and mayors	5	1
Business men	3	0
Professors	6	1
Utility executives	11	1
	43	6

Federal regulation to any degree is distasteful to the utilities and they see no occasion for it now. The state and municipal authorities are divided on the need for it, but a surprising fraction of them admit it, perhaps because their opinion is flavored by the threat of inevitability, knowing the congressional trend toward federal monopoly of governmental prerogatives. College minds are again at this point the apostles of a new order.

	Federal Regulation Necessary?	
	Yes	No
Commissioners	7	16
Governors and mayors	4	4
Business men	1	4
Professors	9	3
Utility executives	0	12
	21	39

"It has always seemed to me that there has been a woeful lack of control by the states and cities jointly, or preferably by the national government, in the matter of pyramiding of stocks, holding companies and other devices so generally used to pyramid values and gouge the public by unreasonable charges for public utility service to the cities."—CITY MANAGER C. O. SHERRILL, *Cincinnati.*

"The utilities themselves will doubtless be demanding certain federal regulation before very many years. This will be especially true when state regulation becomes more effective."—PROF. C. O. RUGGLES, *Harvard.*

"Federal regulation of the issuance of securities of interstate utilities, as well as such regulation of the holding companies, is needed more as a protection to the investor than to the rate payer. Critics of state commission regulation should distinguish between the prices paid for utility stocks and holding company stocks in the recent past with dividends declared by the operating utilities."—COMMISSIONER FRANK P. MORGAN, *Alabama.*

Federal court influences

Often the loose opinion is expressed that federal court rulings have been a repressive influence in two aspects of state regulation of the utilities. In some cases the consequence is said to have been a congealing of principles that makes for inflexibility where flexibility is tantamount to meeting rapidly changing conditions. In others the unwillingness of the court to be rigidly specific has left the commissions perplexed in attempting to frame a long-range policy. Court review may often fail to include all the facts assembled by the commission in support of its rulings. The questions asked here were:

> Do you believe that federal court decisions have unduly repressed the effective functioning of the state commissions in response to economic factors?
>
> Is it your opinion that the federal courts should be required to consider the testimony and record on which the commission based its decision?

On these points the utilities are single-minded that the court rulings have been no obstacle, whereas the commissions are disposed to feel that they have been

hindered in their usefulness. Both parties agree that the court should consider all the factors that the commission felt should rightfully have entered into its decisions; they have the support of the other groups in this, although the latter are less sure that the court rulings have been a deterrent to forward-looking regulation.

	Court Decisions Repressive		Weigh the Entire Record	
	Yes	No	Yes	No
Commissioners	18	6	21	2
Governors and mayors	3	3	7	1
Business men	1	2	1	2
Professors	6	4	10	1
Utility executives	0	12	11	0
	28	27	50	6

"Most assuredly. The state courts only should act." —COMMISSIONER F. SCATTERTON, *Wyoming.*

"Yes, to the extent they have attempted to fix rates on intangible and unearned increment values, this will destroy regulation and promote municipal ownership and operation."—CHAIRMAN J. F. SHAUGHNESSY, *Nevada Commission.*

"Granting, for the sake of argument, that these federal court cases and utility appeals to federal courts are an interference with the flow of state regulation, to what extent has the stream been obstructed? New York State ought to furnish a good example because everything bad which has been said about the federal courts has been gathered together and repeated there.

"From 1929 to 1928 inclusive, 11,440 final orders were made in proceedings before the commission. Of these 11,440 cases only 32 were appealed to the state courts. Of these 11,440 cases, only three got into the federal courts.

"So, then, if only three of the 11,440 formal complaints got into the federal courts it would look as if the main current of commission regulation had not been interfered with very much by federal court appeals in New York State. What is true in New York is true in other states.—H. C. SPURR, *Editor Public Utilities Fortnightly.*

The common denominator

The common denominator does not protrude out of this algebraic complex. In fact, the suspicion that much of the diffusiveness of thinking about regulation is due to the multiplicity of parties at interest is pretty well confirmed by these few opinions. Then, again, one cannot fail to note what might without aspersion be distinguished as a selfish motive behind the answers. Thus the commissioners may be forgiven for a fondness for most of the powers they now have, for a desire for such extensions of them as will add to the effectiveness of the present ones, for preferring the particular route by which they acquired office and, above all, for expecting a compensatory salary. It is not strange that they should want to regulate holding companies, if such can be defined, nor that they are hopeful of the interstate compacts and restive about federal regulation and court obstructiveness.

On the other hand, one can overlook the aversion of the utilities to facing a marked extension of the regulatory powers into fields which verge into the realm of private initiative and enterprise. Manifestly, they are for strong appointive commissions, well qualified and well paid. It is to be expected that they should be convinced of the minor significance of interstate transactions and assured of the feasibility of interstate compacts rather than federal regulation for such matters as transcend the lines of state authority. Likewise, it is perhaps natural that they should be content with federal review of rate cases as it has transpired; nevertheless, they must be commended for their advocacy of closer correlation between the procedure in federal courts and the procedure before the commissions in the cases which reach the courts.

The university thought appears to be the most restive and radical and may be accepted as an exaggerated index of uncrystallized public opinion. They, of all groups, are most anxious for federal solution of a lagging state contingency, they believe the holding company has deep significance to regulatory efficiency and that interstate ramifications must be met to surmount the apparent pause in regulatory progress.

As for the few business men who had confirmed opinions which they vouchsafed to express, it appears that they have a bifurcated mental picture of the regulatory situation. As users of electric service in connection with businesses they are part of the public mind of consumers desiring fair rates compatible with good reliable service. As custodians of invested capital, on the other hand, they uphold the prerogatives of the utilities in the matter of private action free from communal restraint.

The way out

What, then, must be the conclusion about the recent obstacles to perfect regulation and the early prospect of one sublime and majestic scheme of regulation that will still all clamor for change? The obstacles exist, no denying it, but it does not appear that a formula lies within our reach that will render a universal solution without leading into deeper morasses. But regulation has by no means failed, nor is it likely to fail. State regulation can be relied upon to perform the functions expected of it ever since its institution, because it is supplemented now by the voluntary aid of the new temper in business.

The significance of this new factor is sensed by one of the general-business executives who replied that, "even without public regulation of any kind, those public utilities which have the proper type of management will function along the lines of maximum service at minimum cost—first, because their success depends upon a satisfied public, and, second, because the consuming public to a very large extent are now stockholders in public utilities. In our opinion, no regulation whatever would probably be better for the public than too much regulation."

But the fairest, sanest and broadest conception, recognizing the acute technical impediments to theoretically perfect regulation, and visioning its most practical substitute, was contributed by the accredited leader of the electrical industry, Matthew S. Sloan, president of the National Electric Light Association and president of the New York Edison Company. He says:

"It has been a great thing for America that these utility industries have been able to make such a wonderful contribution to American life and prosperity.

"I know that state regulation by commission has been a very important factor in bringing that about.

"State regulation by commission has stabilized our securities as investments, has created a widespread confidence in the integrity of our accounts and the good faith of our operations and has exerted a constant and often undue pressure in behalf of costly extensions or plant and facilities and in behalf of drastic reductions in rates even before reductions are warranted.

"Without the presence of some supervening institution, like the public service commission, the utility industries of the country could hardly have obtained the necessary capital to make the enormous expenditures the public demand for service has compelled. The commissions often insist that we reduce our rates first and then go ahead afterward to bring about the economies to make such reductions possible, but I suppose that is a part of the price we pay for an orderly system of public regulation and safeguard.

"So I have the heartiest sympathy with all efforts to improve the public service commission law and its administration. I expect to get along under whatever regulatory laws may be set up. The business of rendering electrical service under public regulation will go right on. The people need our electrical service more than they need anything else in this town, and *they* will require that our service be kept going, at reasonable rates.

"I am just as much interested as any commission could be in the conducting of the affairs of these companies along lines compatible with the public interest, and giving to the public the best possible service at rates neither too high nor too low. I always try to keep the public interest chiefly in my mind, and I am perfectly willing to have any state commission keep tabs on me and check up on me to see that I do not overlook anything that could be done to improve conditions."

And so the matter rests and bids fair to remain until some Moses arises to lead us reluctantly out of this wilderness into a Utopia where a Solomon makes the laws and a Portia interprets them.

Planning Service Facilities on Continued Industrial Growth

By R. H. BALLARD

President Southern California Edison Company, Ltd.

THE demand for industrial power in the territory served by the Southern California Edison Company, Ltd., increased 117 per cent in the five-year period, 1925-1929, indicating the gaining momentum of industry as a predominating characteristic of our section of the state of California. Industrial power requirements during 1929 totaled 811,009,965 kw.-hr., as compared with 374,205,837 kw.-hr. for 1925. The steadiness of industrial growth during the intervening years is illustrated in records of the demand for 483,762,614 kw.-hr. in 1926, 579,228,434 kw.-hr. in 1927 and 655,118,334 kw.-hr. in 1928.

There has been for the past several years a definite movement on the part of nationally known concerns to establish Western plants. Southern California has attracted many of these. Coincident with this westward movement, local industries have expanded their manufacturing and marketing activities and new industries have been developed. At the beginning of this five-year period our company had on its lines 99 industrial services of 500 hp. or more, while at the close of 1929 there were 209 services of this capacity.

Our plans for the next five years are based on the assumption that the rate of increase which we have experienced during the past five years will continue. Our generating capacity has been increased to 1,253,000 hp. with the addition of another 134,000-hp. unit this year in our Long Beach steam station. Our transmission and distribution systems are now being extended and reinforced to keep well ahead of the growing demands for greater service. The stimulating effect of industrial expansion in our territory is reflected in the increased commercial activity in virtually all lines of endeavor.

Rock Island development on Columbia River under construction

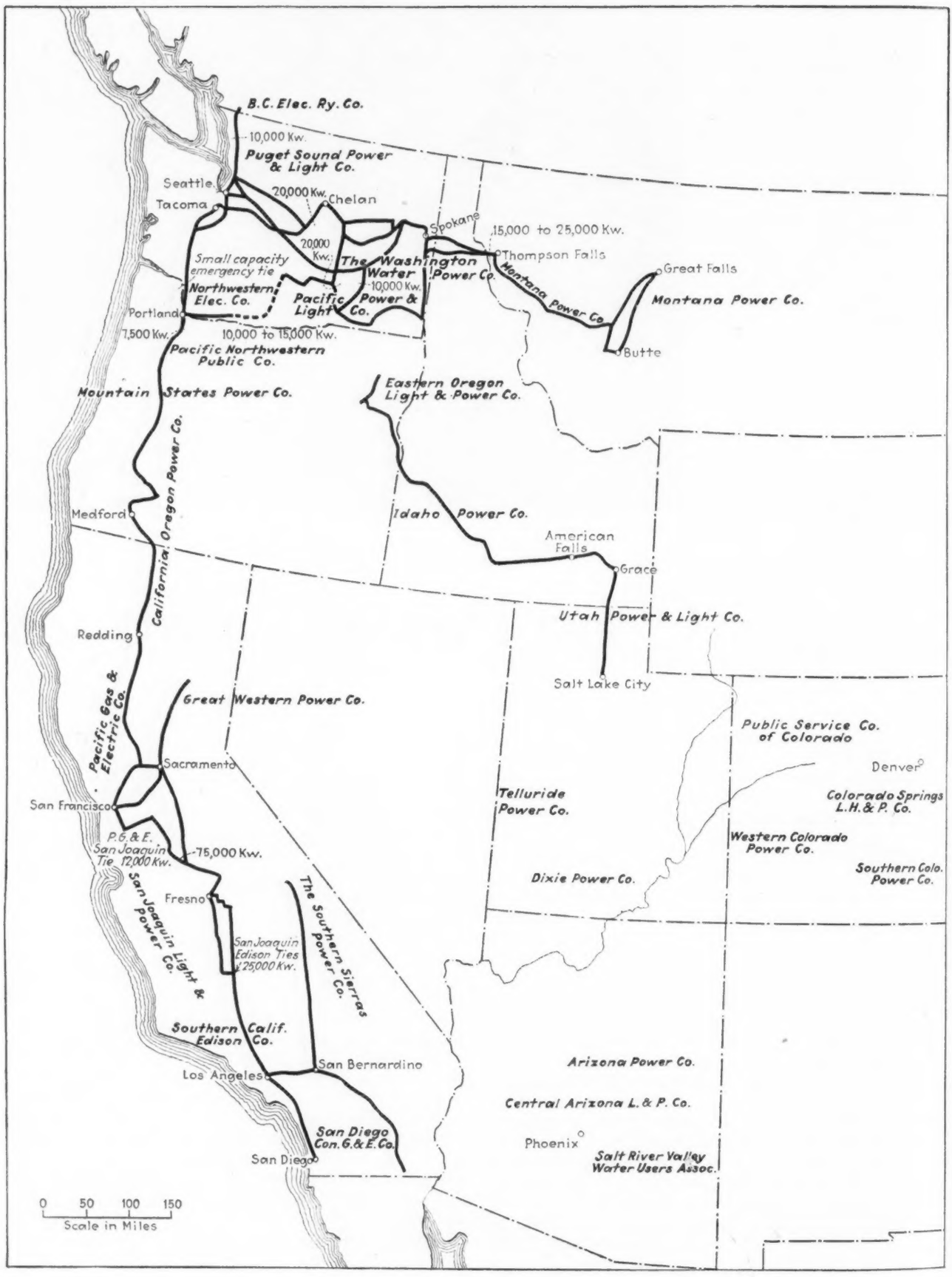
Meeting Pacific Coast Power Demands

TEN years have seen a marked change in the situation as it affects development of power to meet the rapidly growing demands of the West Coast. A combination of factors has influenced this change. Several dry years, coupled with practically stationary hydro construction costs and little room for greater efficiency, as opposed to declining steam costs and increasing efficiency, have been most important among contributing causes. Cheap natural gas now available in northern as well as southern California promises further to accelerate a definite trend toward higher ratios of steam-generated power. Colorado River power is a factor that must also be reckoned with in southern California sooner or later. From the end of 1922 to December 31, 1929, a period of seven years, total generation of sixteen major companies had increased from 6,878,000,000 kw.-hr. to 13,432,952,000 kw.-hr., or practically doubled, and the aggregate system peak from 1,500,000 kw. to 2,723,000 kw. To meet this demand a total of 1,841,000 kw. of new generating capacity was added, 60 per cent of which was hydro and 40 per cent steam. The average rate of growth for all companies based on kilowatt-hours for this period was 13.3 per cent per year, or at the rate of approximately 10 per cent compounded annually. System investment during the same period increased from $784,000,000 to $1,381,000,000, or 76 per cent. On this basis, for every kilowatt of additional generating capacity there was spent $3.10 in power plants, transmission, distribution and for all other purposes. Thus the electric market for these major systems in this section of the country amounts to approximately $100,000,000 per year.

Projecting this rate of growth into the future, it is found that the central station business on the Coast will be a $2,300,000,000 industry by 1940, requiring 6,500,000 kw. of generating capacity and having an annual output of 22,000,000,000 kw.-hr.

In 1922 generating capacity of sixteen major Pacific Coast utilities consisted of 74 per cent hydro and 26 per cent steam, but by the end of 1929 the ratio had changed to 67 per cent hydro and 33 per cent steam. This trend was most marked in southern California, where there is a supply of oil and natural gas available at reasonable prices which will last for at least a quarter of a century. In 1922 capacity of four large companies in that section was 57 per cent hydro to 43 per cent steam. By March 1, 1930, large additions to steam capacity had changed this ratio to 45 per cent hydro and 55 per cent steam. Even in the Pacific Northwest, the stronghold of hydro, the steam ratio has been increasing due to the necessity of greater standby capacity occasioned by a series of low-water years. Hydro, however, will continue to carry base-load requirements for a number of years to come, whereas in southern California just the reverse of this

Backbone of Pacific Coast Interconnected System



SYSTEM DATA FOR SIXTEEN MAJOR WEST COAST POWER COMPANIES (1929)

	Total Capacity, Kw.	Total Generation (Thousands Kw.-Hr.)	System Peak (Kw.)	Annual Load Factor, Per Cent	Electric Customers	Gross Revenue	System Investment
Southern California Edison Company, Ltd.	839,500	3,189,600	571,000	63.2	440,055	37,734,000	$315,000,000
Pacific Gas & Electric Company	676,500	2,141,000	513,800	61.9	549,816	41,854,000	234,700,000
Great Western Power Company	249,400	1,049,765	155,580	64.2	64,688	9,826,000	124,164,000
San Joaquin Light & Power Corporation	164,105	524,100	174,090	....	82,109	10,414,000	79,500,000
Los Angeles Gas & Electric Corporation	148,700	304,071	90,000	38.8	159,254	7,880,000	41,763,000
Southern Sierras Power Company	78,163	223,764	55,800	61.4	28,224	4,453,000	31,152,000
San Diego Consolidated Gas & Electric Company	74,000	181,283	45,200	46.8	70,196	4,510,000	22,172,000
California Oregon Power Company	96,898	401,987	94,575	49.5	23,820	.....	.....
Pacific Northwest Public Service Company	106,980	597,000	123,600	55.0	101,731	7,408,000	50,604,000
Northwestern Electric Company	52,100	239,320	56,000	59.4	29,022	3,179,000	16,105,000
Puget Sound Power & Light Company	222,735	891,000	193,392	55.6	141,740	12,486,000	104,929,000
Pacific Power & Light Company	47,266	189,130	46,115	63.0	53,748	4,382,000	.....
Washington Water Power Company	188,310	854,800	170,600	59.2	51,918	7,286,000	48,522,000
Montana Power Company	250,100	1,582,439	224,000	82.0	65,954	10,560,000	.....
Idaho Power Company	71,500	451,093	66,365	77.0	37,405	3,328,000	34,758,000
Utah Power & Light Company	231,887	613,200	142,505	70.7	103,193	.....	.....
	3,498,144	13,432,952	2,722,722	....	2,002,873	$165,300,000	$1,102,869,000

situation is nearly at hand. The accompanying table gives pertinent data on the sixteen systems under discussion for the year 1929.

Along with this rapid electrical development has come 220-kv. transmission and a great many interconnections, until now all major utility systems from Montana to the California-Mexican border are interconnected. The accompanying map shows this interconnected system as well as points of tie and interchange capacities. Interconnection first was used merely as a convenience or in cases of emergency, but during the past few years several of the large systems have operated permanently interconnected, some for straight sale of power and others for interchange.

In seven years interconnection in the Northwest has reduced reserve generating capacity over peak load requirements of five systems from 15 per cent to 9 per cent.

It is making possible co-operative power development between several systems; total steam reserve may be put to best use and full advantage can be taken of diversity in run-off of water sheds.

These interconnections are now beginning to influence power development, particularly in Oregon and Washington. For several years a co-operative plan of development has worked to the mutual advantage of the Northwestern Electric Company and the Pacific Northwest Public Service Company (formerly Portland Electric Power Company). With the completion of a 110-kv. tie between the Northwestern plant at White Salmon, Wash., and the Pacific Power & Light system at Yakima, Wash., three systems will be able to absorb the output of a new 45,000-kw. hydro plant under construction by the Northwestern Electric Company on the Lewis River.

Under this set-up power could be passed clear across Washington and Idaho and into Montana if desired. Also, it will make possible utilizing to best advantage the Portland steam reserve to aid the utility systems in this interconnected group that lie east of the Cascade Mountains. Moreover, run-off west of the Cascades is almost diametrically opposite that east of the mountains, and under a co-ordinated power development plan it should be possible to reduce the ratio of peak to installed capacity on these systems and materially lower system investment costs.

This tendency is already beginning to manifest itself, as shown by the fact that in 1922 the peak of the five large utility systems in Oregon and Washington was 85 per cent of total generating capacity, whereas in 1929 the combined peak was 91 per cent of total capacity. This reduction in reserve capacity was made despite an increase from 24 to 28 per cent in steam-generating capacity, largely for standby service, and indicates the effect that interconnection has on this one phase of utility operation alone.

In California a 100-mile, 220-kv. transmission line connecting the Great Western Power Company with the San Joaquin Light & Power Corporation has enabled the San Joaquin company to draw stored water hydro from the 1,300,000 acre-ft. Lake Almanor reservoir of the Great Western during periods of low run-off in the San Joaquin territory. Likewise, when hydro can be operated at full capacity and high-load factor on the San Joaquin system, power is returned to the Great Western and water stored by shutting down 60,000 kw. of hydro generation on the Great Western system.

One of the greatest advantages yet to accrue from interconnection and treating several systems as one is the possibility of utilizing several systems to absorb the output of a large hydro development that otherwise would be entirely too large for any one system to absorb alone in a reasonable period of time. Such a situation exists in the Northwest, where there are several sites on the Columbia River capable of economically developing from a third to three-quarters of a million horsepower, providing the bulk of the power can be utilized upon completion of the plant. With interconnection as it is now progressing this will soon be possible.

In California the situation is somewhat different. Here hydro developments have been pushed so far back into the mountains that plants are costly and the necessarily long-distance transmission is expensive. Because of cheap fuel and high economy the trend is definitely toward steam and interconnection is of less advantage. There will still be long-distance transmission, but it is much more likely that it will be transmission of natural gas instead of electrical energy. A 22-in. gas line is about the equivalent of four 220-kv. transmission lines and costs only approximately three-quarters as much.

This means that it is much more logical to pipe gas to electrical load centers for steam-electric generation than it is to transmit the energy electrically.

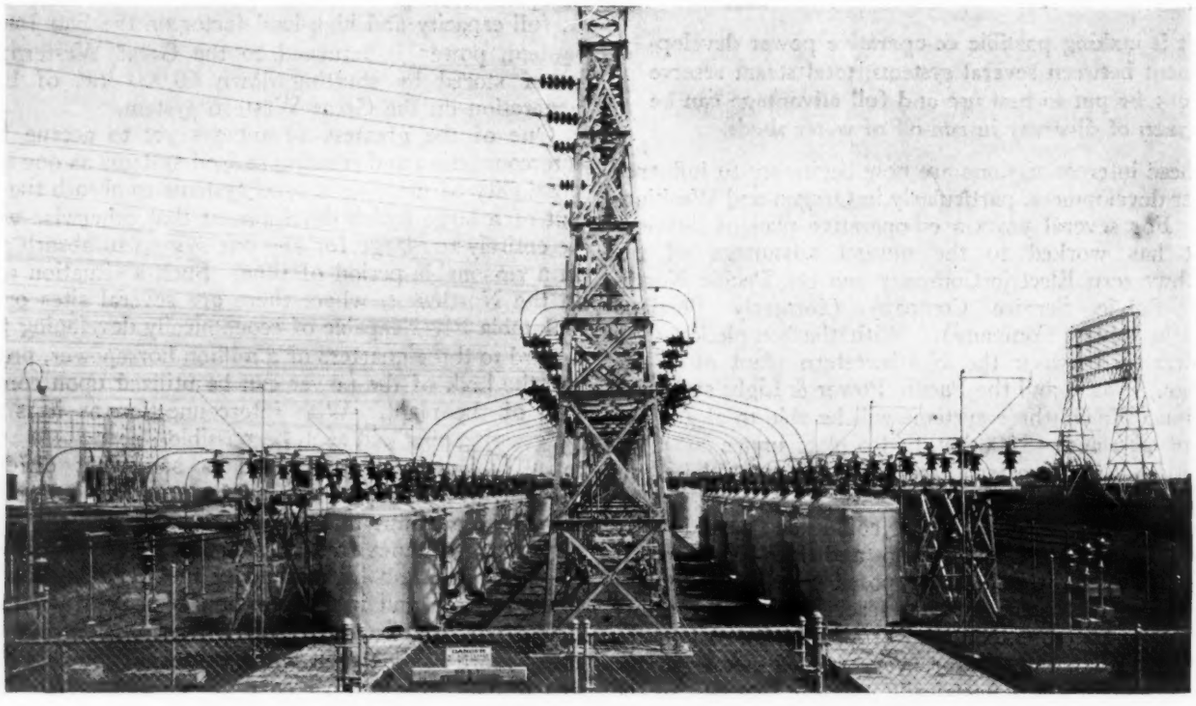
There is a reason for all this talk about natural gas and the importance being attached to it. On September 1, 1929, there became effective in California a gas conservation law which prohibits unreasonable waste of natural gas. Prior to this time there had been wasting to atmosphere about 30,000,000,000 cu.ft. of natural gas each month. This quantity of gas would operate a 6,500,000-kw. power plant at 70 per cent load factor continuously. This amount of power is nearly four times present requirements of the entire state of California, about three times that of the entire Pacific Coast and sufficient to supply the 6,500,000 kw. required by the sixteen major West Coast companies in 1940.

With gradual enforcement of this law a means of disposal of this gas must be found. Some will be eliminated by curtailment of oil production; additional quantities can be used by the oil companies themselves; some can be pumped back into the ground for repressuring old fields, and underground storage will absorb some. However, at least a fourth of it must find a market. This means that great quantities of cheap natural gas having a heat content of around 1,000 B.t.u. per cubic foot will be available for industrial use and power generation. It has been stated by those familiar with the situation that oil producers may eventually be willing to give away their gas at the field for the sake of continuing oil production, for there is a certain ratio between the amount of oil produced and the gas given off. Whether such a thing will come to pass is any one's opinion, but one thing is certain, California has an abundant supply of cheap fuel for years to come, and it is going to have an important bearing on power production in that state in future years.

Still another factor enters the power picture in the Pacific Southwest. Some day 600,000 hp. will be developed at Boulder Dam and half or more of this must be absorbed by the Southern California power market. By the time the government's 1.63 mills power in the falling water at Boulder Dam is converted into electrical energy and transmitted to southern California the cost will be approximately 4 mills per kilowatt-hour. When it is known that steam power could be generated with oil 20 per cent higher than the present market and be on a parity with Boulder Dam power, it is quite obvious that Boulder Dam power will not be cheap power.

Boulder Dam power is a liability—not an asset. Accelerated development of the Pacific Southwest is the only justification distributing agencies of southern California have for agreeing to market the power in order that the government can amortize its investment and proceed with flood control and development of an additional water supply.

Notwithstanding, electric utilities, both municipal and private, will take and absorb their share of Boulder Dam power and make the best of the cost, feeling that flood control and development of a future water supply on the Colorado and the industrial and agricultural development which will follow are in the best interests of the community as a whole. From this brief discussion it will be seen that power production on the West Coast presents an interesting picture. All of the trends here brought out have resulted from a changing economic situation; they are natural, logical and orderly, but above all, one thing stands out—the Pacific Coast is assured of adequate and cheap power for an empire in the building.



Distributing power is as much of a problem as generating it

Thirty 66,000-volt distribution circuits will radiate from this distinctly West Coast substation

Men of the Industry

Alexander and Fluehr New Executives of Illinois Utility

E. D. ALEXANDER, who recently assumed the duties of president of the Illinois Northern Utilities Company, Dixon, is one of the pioneers of the electrical industry, his career in that field having begun in 1890, when as a

E. D. Alexander

young man of 30 he secured employment with the Englewood Electric Company. In 1895 he was made vice-president and general manager.

In 1898 Samuel Insull secured control of the Commonwealth Electric Company and its expansion soon caused it to take over the Englewood company. Mr. Alexander was appointed superintendent in charge of the southern district of the Commonwealth Electric Company and its successor, the Commonwealth Edison Company. He remained in this position until 1909, when he became assistant secretary and assistant treasurer of the North Shore Electric Company, one of the units of the present Public Service Company of Northern Illinois.

Mr. Alexander resigned from this position in 1913 and moved to Dixon to become assistant to the president of the Illinois Northern Utilities Company. In 1914 he became the vice-president of the company and has retained that position until his recent promotion to the position of president.

G. B. Fluehr is distinctly a product of the local organization, having started his electrical career with the companies that later consolidated to form the Illinois Northern Utilities Company. His affiliation with the organization has been continuous. After some experience in the field of telephony, he secured a job with the Amboy Light & Power Company in 1907. Mr. Fluehr had a taste of every phase of operation from constructing lines to running the power house, and from firing the boilers to keeping office records. A consolidation with the Oregon Power Company was effected and Mr. Fluehr was placed in charge of the southern division with headquarters in Amboy.

When the Illinois Northern Utilities Company was organized Mr. Fluehr was assigned to Morrison, but he was moved to Sterling as district

G. B. Fluehr

superintendent. After serving in Sterling for six years, Mr. Fluehr was moved to Freeport in 1919. His following eleven years of successful operation in this district stamped him as the logical successor of Mr. Alexander for the position of vice-president of the company.

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L. W. W. MORROW, editor of the ELECTRICAL WORLD, sailed for Europe June 4 aboard the Hamburg-American liner *Resolute*. With Bancroft Gherardi, Mr. Morrow will serve as official delegate of the American Institute of Electrical Engineers at the hundredth anniversary of the Independence of Belgium, to be held June 16 at Brussels. Mr. Morrow will also be vice-chairman of section 23, World Power Conference, "Problems of World Power Supply," in Berlin June 17-26. After attending the conference, a complete report of which will appear in the ELECTRICAL WORLD, he will visit Germany, Austria, Italy, Switzerland, Czechoslovakia, France and Great Britain, where he will observe electrical industry activities. Reports of his European observations will be published in a series of articles in the ELECTRICAL WORLD.

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Giuseppe Faccioli Retires

GIUSEPPE FACCIOLI, widely known electrical engineer, has retired from active participation in the affairs of the General Electric Company because of ill health. Mr. Faccioli relinquishes duties as works engineer and associate manager of the Pittsfield works of the company and assumes the position of consulting engineer. At present his health is such that he is unable to walk, although he motors to his office almost daily. Announcement of Mr. Faccioli's retirement was made by C. C. Chesney, vice-president of the company and close associate for 25 years, at the twenty-fifth annual dinner of the Pittsfield section of the American Institute of Electrical Engineers. At that time Mr. Chesney said: "If ill health had not intervened, there would have been no limit to what Faccioli might have done." Mr. Faccioli became identified with the Pittsfield works in 1908.

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OBITUARY

ANDREW L. RIKER, engineer and inventor, died suddenly June 1 of heart disease at his home in Fairfield, Conn. Mr. Riker, who was a pioneer in the development of the automobile, was 62 years of age. As early as 1888 he devoted attention to electric motors with a view to developing a type suitable for vehicle propulsion. In 1900 he began the manufacture of electric trucks, but later he joined the Locomobile Company of America. He was the first president of the Society of Automobile Engineers, a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and other similar organizations.

Financial and Statistical News

WITH brokers' loans at what appears to be a reasonably stable position, volume of sales on the exchange has settled down to what many regard as subnormal levels for this season. Speculative interests seem to have deserted the market for the moment.

——IN CONJUNCTION WITH THE SHARP DECLINE in new bond flotations the banks have increased their bond holdings steadily. Bond men believe that these factors are already operative in improving the technical position of the bond market, although bond trading has been quiet this week.

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March Stock Sales to Customers $15,500,000

MARCH CUSTOMER - OWNERSHIP STOCK SALES continued the upward trend indicated during February. Sales of 226,400 shares, amounting to $15,500,000 in 22,400 transactions, show an increase of $2,500,000 as compared with revised February figures and nearly triple the very low sales of $5,383,000 during March of last year. Revised figures for February show sales of 145,000 shares, valued at $13,000,000 in 24,200 transactions.

The average price per share was $68 in March and $90 in February, showing the influence of over $2,500,000 sales of low-priced stock during March, while February sales of low-priced stock amounted to a little over $700,000. The average transaction in March was about $692 and in February $537.

These estimates are based on reports received by the ELECTRICAL WORLD from central-station companies selling stock directly to customers, employees and other local parties.

Recent Listings

NEW YORK STOCK EXCHANGE has authorized the listing of 430,000 shares of prior preference stock of the Standard Gas & Electric Company ($7 cumulative, no par value) and 100,000 shares of prior preference stock ($6 cumulative, no par value). There has also been authorized for listing 1,430,000 additional shares of common stock of the United Corporation on official notice of issuance in connection with the acquisition of 1,430,000 shares of common stock of the United Gas Improvement Company. Baltimore Stock Exchange has authorized the listing of preferred stock of Consolidated Gas, Electric Light & Power Company of Baltimore to the amount of $1,000,000.

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How Capital Structure Affects Utility Equities

By JACOB KALB

Halle & Stieglitz, Members New York Stock Exchange

AN ANALYSIS of the consolidated capital structures of certain representative electric holding and operating companies reveals a wide range in the total assets for each dollar of common equity and shows that the different amounts so represented have a very considerable bearing on the return to the stockholder on his equity.

The accompanying table, compiled

	Consolidated Gas Co. of New York	Commonwealth Edison Company	Detroit Edison Company	Consolidated Gas Co. of Baltimore	Public Service Co. of New Jersey	United Gas Improvement	North American Company	Standard Gas & Electric Company	American Water Works & Elec.	Columbia Gas & Electric Company
Net fixed capital and other operating income producing assets—average (000 omitted)	$1,067,000	$289,923	$238,328	$122,195	$548,520	$530,152	$672,035	$910,552(7)	$336,772	$473,424
Net earnings—1929 (000 omitted)	79,974	22,217	18,978	10,392	44,863	40,813	55,708	66,802	22,799	41,049
Percentage return on fixed capital, etc	7.50	7.66	7.96	8.50	8.18	7.71	8.29	7.33	6.77	8.67
Investments—average (000 omitted)	.....	.....	.....	.....	.....	$120,163	$54,900	.....	.....	.....
Non-operating income (000 omitted)	(a)	(a)	(a)	(a)	(a)	14,147	4,533	(a)	(a)	(a)
Percentage return on investment	.....	.....	.....	.....	.....	11.7	8.29	.....	.....	.....
(A) Average net assets per $1 of average common equity	$1.78	$1.73	$1.81	$2.86	$3.61	$2.23	$4.62	$9.76	$5.42	$2.23
(B) Amount earned on item (A), cents	13.35	13.25	14.40	24.31	29.52	18.86	38.30	71.54	36.69	19.33
(C) Percentage paid on average senior capital (2)	5.57	4.92	5.17	4.59	5.74	6.10	5.85	6.77	5.90	5.79
(D) Amount paid on senior capital ex (A—$1), cents	4.34	3.59	4.18	8.53	14.98	7.50	21.17	59.30	26.07	7.12
(E) Other prior charges, cents	.....	.....	0.14	.....	.....	0.23	.....	1.36	.....	.....
(F) Percentage on total earnings applicable to common	67.7	72.9	70.0	64.9	49.2	59.0	44.9	15.2	28.9	63.2
(G) Earned on $1 average common equity B-D-E, cts.	9.01	9.66	10.08	15.78	14.54	11.13	17.13	10.88	10.62	12.21
Equity of common per share, end of 1929	$56	$140	$116	$44(3)	$30.9	$13.2	$30	$61.6	$38.8	$24.5(8)
Earned per share on shares outstanding end of year	4.75	11.53	10.28	6.20	4.13	1.55(5)	4.81	6.59	4 00	2.82
Earned per share on average outstanding	5.10	12.76	12.19	6.41	4.19	2.04(6)	5.03	7.01	4.26	3.10

(a) Item is included in other income producing assets. (2) Includes minority interests and interest on unfunded debt and amortization of debt discount.
(3) New stock offered since end of year in ratio of one for ten. (4) Excludes non-recurring income.
(5) Excludes non-recurring income and for shares outstanding end of year. (6) Includes non-recurring income.
(7) Includes Shaeffer Oil & Refining Company. (8) 25 per cent stock dividend paid since January 1, 1930.

from 1929 and 1928 annual reports, gives the average net fixed capital and other income-producing assets and also states the earnings reported after federal income taxes. From these is figured the percentage return earned on the average net book value of each company. For the companies included in this compilation the percentage return ranges between a low of 6.77 per cent for American Water Works & Electric Company to a high of 8.67 per cent for Columbia Gas & Electric Company, with others, like Consolidated Gas of New York and Commonwealth Edison of Chicago, showing a return about half way between.

Equity and amount of senior capital

It is with the equity in these earnings to which the common stock is entitled as affected by the amount of senior capital that the remainder of the computation is concerned. To bring all cases to a comparable basis, the net assets of each company are reduced to a figure showing the total average net assets for 1929 for each dollar of common equity. This figure (item "A") is an index of the amount of senior capital before the common stock, and also shows the total invested capital on which earnings, less charges on senior capital, accrue to each dollar of common equity.

For instance, Consolidated Gas of New York has total average assets of $1.78 for each dollar of average common equity. The return on this amount is 13.35 cents, being $1.78 × 7.50 per cent. Senior capital requires 4.34 cents of this amount, leaving 9.01 cents for each dollar of average common equity. Some cases will be noted where the common represents a considerably smaller proportion of the total assets than is the case with Consolidated Gas of New York, and yet the yield on the common equity is but little greater.

It will be observed, therefore, that the earnings per share are roughly equal to the equity of each common share times the amount earned on each dollar of common equity. Thus we find that the earnings per share are the result of two factors having in some cases a considerable range. To illustrate, Consolidated Gas of New York earns 9.01 per cent with a book value of $56 for each common share, or $5.10 a share on average shares outstanding during 1929, while North American reports approximately the same amount per share, but it is the result of 17 per cent earned on a book value of $30 per common share. Between these two cases are various combinations of book value and earning rate, and, of course, with each are various degrees of security and greater or lesser possibilities for increasing the profits for the common stock.

While any opinion concerning the prospects of an individual company depends on the weight assigned to each factor, the analysis permits an appraisal of each item as it might be affected by an increase or decrease in the rate of return on the total assets, by a readjustment in the capital structure resulting from additional financing or by certain conditions inherent in any company being studied.

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Electric Bond & Share Makes New Offering

THE ELECTRIC BOND & SHARE COMPANY made an offering of 200,000 shares of cumulative $5 preferred stock at $91.50 a share and accrued dividends, to yield over 5.45 per cent. Proceeds from the sale of this stock will be used for general corporate purposes of the company. The new issue is callable at $110 and accrued dividends.

NEWS BRIEFS

Four names were added to the board of directors of the Indianapolis Power & Light Company at the annual meeting of stockholders—Frank D. Stalnaker, president of the Indiana National Bank; Elmer W. Stout, president of the Fletcher American National Bank; Bernard Korbly, attorney, and Emmet O. Ralston, chief engineer of the company.

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Securities Union Corporation has been formed in Delaware to facilitate the exchange of not exceeding 25 per cent of the common stock of the Columbia Gas & Electric Corporation for common and $3 preference shares of the United Corporation.

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Directors of the Tri-City Railway & Light Company, Davenport, Iowa, have called a special meeting of stockholders for June 19 to vote on the dissolution of the company as a means of simplifying the financial structure of the United Light & Power Company, which owns the Tri-City organization.

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Following his election to the board of directors of the New York Edison Company, Floyd L. Carlisle, chairman of the Niagara Hudson Power Corporation, was chosen to succeed the late Nicholas F. Brady as a trustee of the Consolidated Gas Company of New York at a meeting of the trustees.

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Gross earnings of Toho Electric Power Company, Ltd., for the year ended October 31, 1929, converted into dollars at 50 cents per yen, were $25,312,338, as compared with $24,275,432 in year ended October 31, 1928. Gross income available for interest was $10,978,439.

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NEW SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN MAY

Name of Company	Amount of Issue (Par Value)	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Puget Sound Power & Light Co.	$9,000,000	20	First and refunding mortgage gold bonds, series C	To discharge obligations incurred for additions to plant, to pay off maturing bond and note issues, for further additions to plant and for other corporate purposes	5	95½	5.37
City of Tacoma, Wash. (Electric Light and Power Dept.)	3,350,000	4-21	Bonds	Additions and extensions and for the construction and equipment of a steam plant	4¾	....	4.80
Iowa Southern Utilities Co.	2,500,000	20	Gold debentures, series A	To reimburse the company in connection with the acquisition of additional properties, for improvements and for other corporate purposes	6	98	6.17
New England Gas & Elec. Association	20,000,000	20	Convertible gold debenture bonds		5	91	5.75
National Power & Light Co.	15,000,000	100	Gold debentures, series B	To provide funds for retirement of preferred stock and for other corporate purposes	5	91	5.50
National Power & Light Co.	15,225,000	...	Cumulative preferred stock		6	101½	5.90
Kansas Gas & Electric Co.	16,000,000	50	First mortgage gold bonds	To redeem 6 per cent bonds	4¾	93¾	4.85
Public Service Corp. of New Jersey	14,625,000	...	Cumulative preferred stock	To reimburse for advances made to its subsidiaries, for additions and betterments and for other corporate purposes	5	97.50	5.12
Intercontinents Power Co.	3,000,000	18	Convertible debentures	Additions and betterments	6	97	6.25
Coast Counties Gas & Electric Co.	4,000,000	30	First mortgage gold bonds, series A	To retire all bonds of subsidiary companies, to provide for extensions and to reimburse for additions and for other corporate purposes	5	99¾	5.03
Total	$102,700,000			Rights	$1,741,600		
Total amount actually realized	97,807,750			Total financing for May	99,549,350		

Market Conditions

MAY BUSINESS on the Pacific Coast was somewhat disappointing, but this week's totals are encouraging. Heavy equipment is active. Foreign business is developing favorably in the East and the general outlook is decidedly encouraging.

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PACIFIC COAST

—EQUIPMENT BUSINESS IS FAIR, *though May showing was rather disappointing. Power company buying is proportionately the heaviest of all electrical branches.*

Heavy equipment is moving satisfactorily, but few orders of motors are recorded. The orders include a carload of Westinghouse insulators for the Northwest, four 25-hp. General Electric variable-speed motors and fuel oil equipment, total value $7,500, for San Francisco, and three 72-kva. induction regulators valued at $9,000 for central California installation. Industrial buying is better, including a $15,000 generator set for Seattle, $15,000 rotors and stators for a Pomona pump plant and $14,000 Westinghouse motor parts for a San Francisco oil burner manufacturer. Range sales continue excellent, Westinghouse reporting a carload each to Los Angeles and Salt Lake. Lighting installations help support a rather weak contracting market, including baseball park lighting projects for San Francisco, Sacramento and Modesto, with many athletic stadiums being figured. Street-lighting projects include a duplex standard installation for downtown San Jose, a $7,000 Oakland award, a $17,000 San Francisco award, an electrolier job for Fresno and $4,000 worth of lead cable and floodlights for an Alameda airport. State purchasing is good, in order to close out budget balances before close of fiscal year on July 1.

Board of contracts and awards, Tacoma, opened bids for superstructure for Cushman power house No. 2, for over 10,000 ft. of 58-in. steel pipe and for fifteen small steel towers, total approximating a $300,000 outlay, and contracts are expected to be let within the next few days. American Brown Boveri, Inc., submitted low bid, $76,000, to the city of Seattle for furnishing thirteen 2,000 and three 4,000-kva. transformers for local substations. The city of Tacoma opened bids for furnishing 20,000 lb. of No. 4 and 30,000 lb. of No. 6 copper wire. Klamath Falls, Ore., let a contract for a new lighting system costing $25,000 and an award was made for beacons every 10 miles on the Portland-Pasco section of Spokane-Portland Airway, costing about $30,000. Hood River, Ore. will install a power plant and street-lighting system costing $50,000, for which bonds have been voted, work to start immediately. City of Seattle ordered about $20,000 worth of distribution transformers ranging from 10 to 50 kw. and about $2,000 worth of miscellaneous switchgear was bought by a local central station.

CONSTRUCTION PROJECTS

San Diego Consolidated Gas & Electric Company, San Diego, Calif., will build transmission line from El Centro to Escondido, to cost $50,000. Pacific Coast Steel Company, San Francisco, Calif., plans plant to cost $100,000. Midland Counties Public Service Corporation, Freso, Calif., plans transmission line and power substation in Stone Canyon district to cost $60,000. Butte, Mont., has authorized an ornamental lighting system. Sandpoint, Idaho, plans municipal hydro-electric power plant to cost $300,000. Pacific Fruit Express Company, San Francisco, Calif., plans addition to car-icing plant at Pocatello, Idaho, to cost $75,000. Southern Colorado Power Company, Pueblo, Colo., plans additions in substations at La Junta, Ordway and Fowler, Colo., and will build transmission line extensions from Ordway to Rocky Ford. Bureau of Reclamation, Denver, Colo., will receive bids until July 1 for one 6,000-hp. vertical hydraulic turbine, a.c. generator and other equipment for Shoshone power plant, Wyo. (Specification 512).

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SOUTHEAST

—ORDERS COMING INTO *supply houses from the Southeast indicate a slight improvement in general business during May, as compared to April, 1930.*

Switchboard equipment for the New Orleans district amounted to $25,000. A carload of weatherproof wire was shipped into Florida. Cotton mills in Georgia purchased approximately $1,500 worth of miscellaneous wiring supplies and the federal government another $1,000 worth of such material. A utility company placed orders for $22,000 worth of wires, poles and meters, while the construction division of the same company placed orders for steel towers in the amount of $55,000 and wires and cables to the extent of $138,500. A cotton mill in Alabama will require $50,000 of equipment and $30,000 in wiring and supplies to complete its recently announced plans for electrification.

Orders for 3,000 ft. of paper-covered cable were received from a utility company in Alabama. An official of the Tennessee Coal & Iron Company announces that bids will be received for wire to be used in the new sheet plant of that organization within the next 30 days.

CONSTRUCTION PROJECTS

St. Louis Electric Terminal Railway Company, St. Louis, Mo., has plans for freight and terminal express building to cost $1,400,000. Union Electric Light & Power Company, St. Louis, Mo., has filed plans for power substation to cost $65,000. Kansas City, Mo., plans freight terminal on waterfront to cost $450,000. Wilburton, Okla., plans municipal power plant to cost $45,000. Grand Hydro-Electric Company, Tulsa, Okla., plans hydro-electric power plant on Grand River, to cost $1,500,000. Fayetteville, Ark., plans airport lighting system. Texas Hydro-Electric Corporation, Seguin, Tex., will build hydro-electric power plant on Guadalupe River, to cost over $1,000,000. Baton Rouge, La., will receive bids until June 10 for airport lighting system.

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MIDDLE WEST

—VERY LITTLE CHANGE *in general business conditions is noticeable this week in the Middle West section. The employment situation has improved slightly and industrial activity is somewhat better.*

—MAJOR ACTIVITIES, *steel, railroad, automotive and electrical industries, if not indicating an increase, do not show a decline in business.*

The various utility companies are continuing their conservative plans for gradual expansion and extension of lines, and all necessary rehabilitation work is being done. There has been a normal demand for apparatus with a better demand for distribution equipment.

Jobbers' sales are somewhat better. While there is considerable room for improvement, more business is being obtained. Most appliances are moving in fair valume, with no unusual demand noted.

CONSTRUCTION PROJECTS

Cliffs Power & Light Company, Ishpeming, Mich., plans hydro-electric power development to cost over $4,000,000. Ford Motor Company, Dearborn, Mich., has plans for power substation to cost over $65,000. Portland, Mich., has authorized extensions and improvements in municipal power plant to cost $50,000. Rockford Electric Company, Rockford, Ill., has filed

plans for power substation to cost $60,000. Aridor Company, Chicago, Ill., will build addition to metal cap factory to cost $140,000. Borden's Farm Products Company, Chicago, Ill., plans bottling plant to cost $300,000. Big Four Railroad Company, Cincinnati, Ohio, plans engine plant and terminal at Beech Grove, Ind., to cost $1,000,000. Minerva, Ohio, will build an addition to municipal power plant. Fisher Body Corporation, Detroit, Mich., will build addition to automobile body plant at Cleveland, Ohio, to cost $300,000. Otter Tail Power Company, Fergus Falls, Minn., plans transmission line at Amenia, N. D., and vicinity. Montana-Dakota Power Company, Minneapolis, Minn., will proceed with superstructure for generating plant at Williston, N. D., to cost $200,000. People's Light Company, Davenport, Iowa, plans transmission line to cost $50,000.

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EASTERN

—ELECTRIC EQUIPMENT ENTERS JUNE *with good prospects in the Eastern district. While the situation continues a little spotty, it is the general consensus of opinion that improved business is on the way, and judging by the orders recorded in the concluding days of May, all primary buying factors are entering the market.*

—CENTRAL-STATION ACCOUNT *shows good activity, industrial demand is prominent for heavy commitments and foreign business is developing the best volume for several months past.*

The demand for prime movers is expanding and the outlook is good. A New York manufacturer has secured a contract from a central station in Washington for hydro-electric turbines totaling $325,000. A Middle West maker has received an order for a Diesel engine unit in Maryland, and will also furnish similar equipment for a municipal installation in Wisconsin. A Pennsylvania manufacturer will supply a turbo-generator unit for a power plant in Louisiana, costing about $700,000. A metropolitan power company has ordered a quantity of switchgear from a state manufacturer to cost $450,000, while a West Virginia utility company has contracted with the same company for like equipment to an amount of $50,000.

Important awards are following for foreign account. Continuing its purchases for a proposed nitrate plant in Chile, the Anglo-Chilean Consolidated Nitrate Corporation, New York, has placed an order with the International General Electric Company for 26 electric haulage locomotives, of combination trolley and storage battery type; also, with the same company, for one industrial gas-electric locomotive, and with the Westinghouse Electric & Manufacturing Company for two such units. The Westinghouse company has secured a heavy commitment from the Anglo-Chilean company for transformers and other equipment, including line apparatus. Another large export award secured by the Westinghouse company is for four passenger locomotives, 130-ton type, operating at 3,000 volts, developing a speed of 63 m.p.h., for the Chilean State Railways, aggregating about $500,000.

The General Electric Company has entered into a contract with the Canadian Pacific Railway Company for electrical equipment for a Diesel-electric tugboat, including two generating units for main drives and two such units for auxiliary service. The New York Shipbuilding Company, a subsidiary of the American Brown Boveri Electric Corporation, has added to its domestic commitments with an order for two 30,000-ton liners for the United States Lines, the vessels to cost close to $20,000,000 complete.

CONSTRUCTION PROJECTS

Board of Education, New York, has approved plans for Brooklyn Technical High School for vocational instruction, to cost $5,000,000. Hudson Bay Mining & Smelting Company, Ltd., New York, will make extensions in copper concentrating plant and hydro-electric generating station to cost over $4,000,000. Gulf Refining Company, Pittsburgh, Pa., has approved plans for oil storage and distributing plant on Staten Island, N. Y., to cost $2,000,000. Buffalo General Electric Company, Buffalo, N. Y., has filed plans for a power substation to cost about $65,000. RCA-Victor Company, Inc., Camden, N. J., plans experimental radio broadcasting and television station at Collingswood, N. J. Duquesne Light Company, Pittsburgh, Pa., is asking bids until June 18 for six motor-driven centrifugal pumping units and accessories. Department of Commerce, Washington, D. C., will receive bids until June 13 for 100 engine-generator plants (Proposal 22290). Board of District Commissioners, Washington, D. C., will receive bids until June 13 for lamp-post parts, globes, etc.

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NEW ENGLAND

—A SLIGHT ADVANCE IN ORDERS *for electrical equipment was noted in this district during the past week. Negotiations for electrical machinery are being received in an encouraging volume. Small motor sales are steady.*

Northern New England mills are interested in turbo-generators. Recently an order for a 3,000-kw. turbo-generator and accessories was placed; in addition, an order for a 750-kw. turbo-generator set was placed for eastern Massachusetts. Inquiries on hand, according to one manufacturer, are more active at this time than for a corresponding time last year.

Scheduled materials are in good demand; new construction materials are selling in small lots and are attracting less interest. Central-station supplies are dull for heavy equipment; line materials are moving; new distribution systems are projected for southern Vermont and central Massachusetts, the latter to involve about $200,000.

Electric specialties are receiving attention. A manufacturer of continuous conveyor type electric furnaces records a number of sales recently and reports an encouraging interest in this type of appliance. Recently orders for 29 electrically controlled clocks of a nationally known manufacturer were placed.

CONSTRUCTION PROJECTS

Edison Electric Illuminating Company, Boston, Mass., has filed plans for addition to power substation at East Boston, reported to cost over $60,000, and has asked bids for substation at Concord, Mass., to cost close to like sum. Crown Corset Company, Bridgeport, Conn., has filed plans for plant addition to cost about $100,000.

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SOUTHWEST

—THE PAST WEEK *has shown nothing marked in any line of electric business. Some very large contracts are being closed, but not yet announced officially.*

Several small shipments of 10- and 15-hp. motors have been made to the cotton-raising districts of Arkansas and Oklahoma. An order was placed for two motors, 200 hp. each, and some miscellaneous apparatus amounting to $5,000. Another order was for two transformers, steel work and outdoor switches for a small substation in Arkansas to cost $2,250.

CONSTRUCTION PROJECTS

Appalachian Electric Power Company, Roanoke, Va., has approved final plans for extensions in hydro-electric power plant on James River, to cost $1,000,000. Louisville, Ky., plans trade and vocational school to cost $300,000. Knit Goods Corporation of America, Decatur, Ala., plans mill at Corinth, Miss., to cost $450,000. Laurel, Miss., plans ornamental lighting system. Alabama Power Company, Birmingham, Ala., plans power substation at Bridgeport, Ala., to cost about $40,000.

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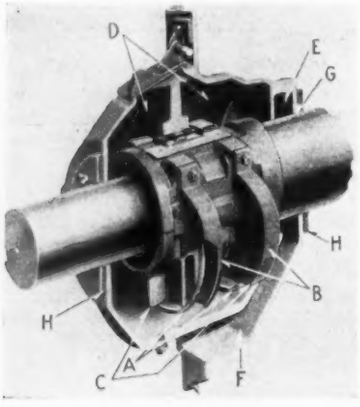
New York Metal Prices

	May 28, 1930 Cents per Pound	June 4, 1930 Cents per Pound
Copper, electrolytic	13	13
Lead, Am. S. & R. price	5.50	5.50
Antimony	7 3⅝	7⅛
Nickel, ingot	35	35
Zinc, spots	4.185	5.00
Tin, straits	31⅛	30¾
Aluminum, 99 per cent.	24.30	24.30

New Equipment Available

Sealed-Sleeve Bearing Has Oil Rings Inclosed

A NEW SPLIT SEALED SLEEVE BEARING in which the oil rings and other sources of oil spray are fully inclosed at all points above the level of the oil in the reservoir is announced by the Westinghouse Electric & Manufacturing Company. The in-



closures form part of the bearing itself. The air space within the housing around the bearing is thus entirely separated from the chambers in which the oil rings turn, so that during operation of the bearing, as well as during periods of rest, the air in this space is entirely free from oil spray.

The interior walls of the housing remain quite dry, and leakage through and along the crevice between upper and lower halves of the bearing housing is entirely prevented. Even the leakage induced by windage is avoided, for although a current of air may pass through the housing as induced by the suction of the blower, it cannot carry oil spray and vapor out of the housing as heretofore because the air in the housing is dry and clean.

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Edgewise-Wound, Heavy-Duty Resistor

EASY CONNECTIONS TO RIGID TERMINALS are made with a new type of edgewise-wound, heavy-duty resistor recently placed on the market by the General Electric Company. This resistor, designated CR-9132, is of the unit box type. Advantages claimed by the manufacturer include unbreakable design, noncorrodible conductor and maximum heat dissipation for minimum space consumption.

The units are offered in the form of a complete line of twenty sizes, covering a current range of from 22 to 136 amp., with a corresponding resistance range of from 2.5 to 0.058 ohms. Four combinations are standard, as follows: (1) Without taps; (2) with a center tap; (3) with two taps at one-third spacing, and (4) with three taps at one-quarter spacing.

Various unit box combinations can be made up with the new resistors, such as four units assembled and connected in series. By using special molded insulation spacer tubes and collars in such assemblies, the need of mica tubes, mica collars, flat washers and spacers is eliminated, and the assembly of the box is greatly simplified by decreasing the number of pieces to be handled and by eliminating the need for cutting and fitting.

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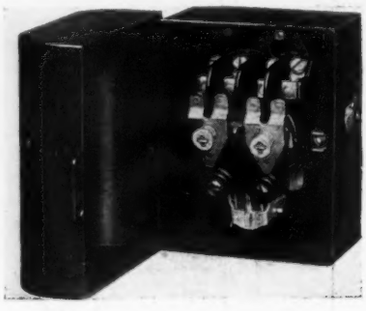
Single-Phase Motor Contactor

A SMALL CONTACTOR known as class 8511 has been announced by the Square D Company, Milwaukee, Wis. The field for this contactor is oil burners, small refrigeration systems, small unit heaters and any application where a small single-phase motor is to be con-



trolled by push button, thermostat, pressure or vacuum switches. The capacity is 15 amp. and is for use with motors up to 1½ hp., 110 volts and 3 hp., 220 volts. It is 5 in. wide, 6¼ in. high and 4¾ in. deep. The net weight is 3¾ lb.

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A PROPELLER FOR A LARGE BLOWER manufactured by means of arc welding is announced by the Westinghouse Electric & Manufacturing Company. It is constructed by arc welding the two-taper, turned and warped plate steel blades into slots cut in the hub. By so doing the cost of a pattern and mold have been saved and at the same time the danger of obtaining a poor steel casting is avoided. The entire blower housing is also fabricated by arc welding. The propeller is 42 in. in diameter and is constructed for a blower of 100,000 cu.ft. per minute capacity at 16½-in. static pressure, driven by a 300-hp., 3,520-r.p.m. motor.

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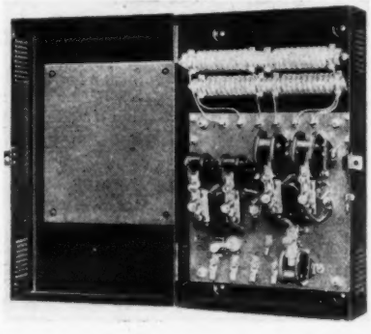
Automatic Lifting Magnet Controller

AN AUTOMATIC LIFTING MAGNET CONTROLLER with an automatic drop arrangement is announced by Cutler-Hammer, Inc., Milwaukee, Wis. The



automatic drop feature relieves the lifting magnet operator of an extra operation of the master switch each time the magnet is unloaded, giving him more time to operate the engine and brake levers and saving considerable time in loading and unloading. Other new features are also incorporated in this new controller. It is fully inclosed and mounted on an asbestos lumber panel which is moisture proof and withstands heavy shocks. Although designed to operate with C-H "Red Top" lifting magnets, this new controller can be used with any other make of magnet.

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Linemen's Flares

A LINE OF FLARES for linemen's use, which it is claimed are characterized by long burning and high penetration power, no matches being required to light the device, is announced by Central Railway Signal Company, Newton, Mass. Two sizes are now available, each being one inch in diameter. A 20-in. length burns eighteen to twenty minues and a 30-in. length 30 minutes. The color of the flame is orange or yellow. Friction cap ignition is used and these flares will burn continuously under water. They are designed to facilitate repair work at night on overhead and underground lines.